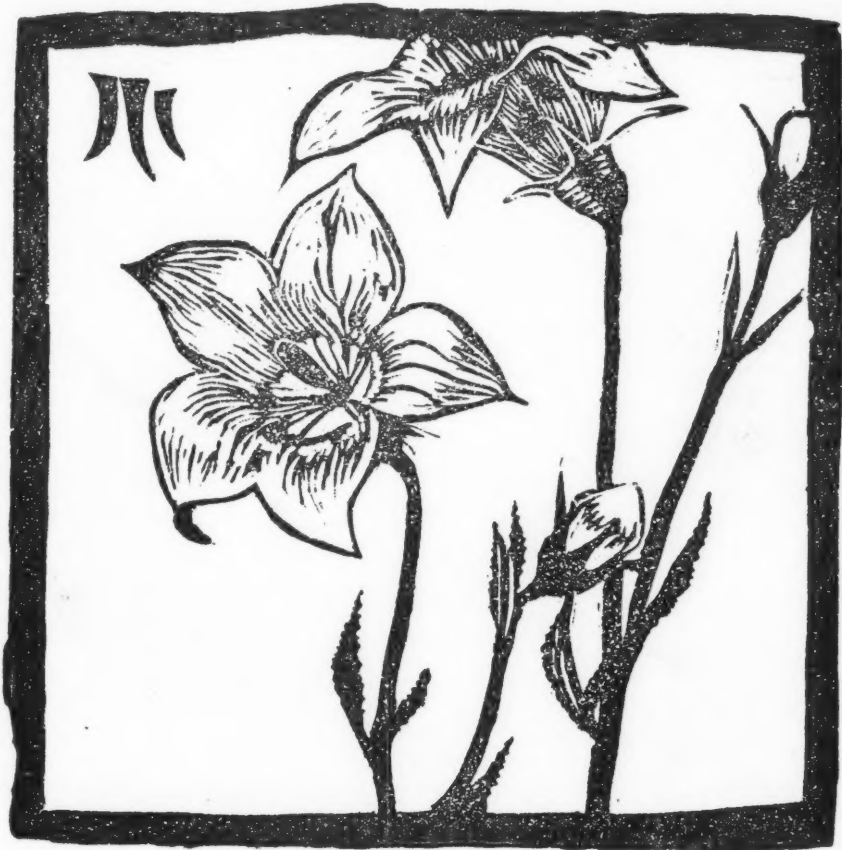


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The NATIONAL HORTICULTURAL MAGAZINE



JOURNAL OF THE AMERICAN HORTICULTURAL SOCIETY

JULY, 1933

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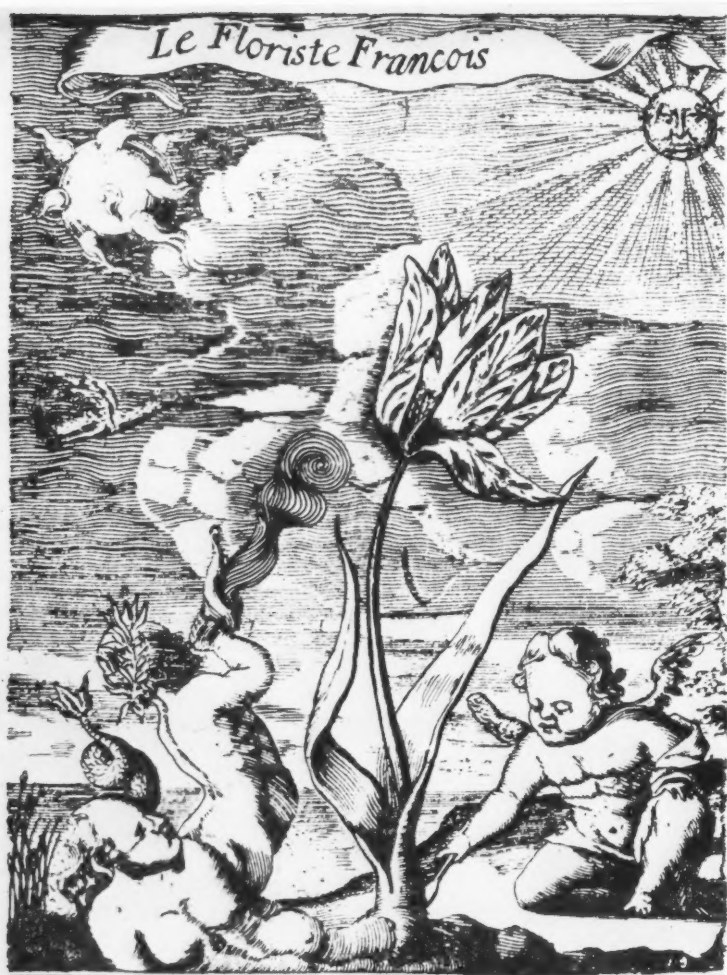
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*C'est L'Amour seul qui me Cultive
 Et Phoebus enrichit mes fleurs
 D'un nombre infini de couleurs
 L'une brune l'autre plus vive
 Prenant le pur des Elements
 Pour composer mes ornements*

Duquesnoy

AROVEN Chez Louis du Mesnil dans la Cour du Palais 1658

Figure 1. Allegorical title of La Chesnée Monstereul, "La Floriste François" (19) 2d ed., 1658. Photographed from "Tulips," by Joseph Jacob (57, p. 5).

Historical Sketch of Tulip Mosaic or Breaking The Oldest Known Plant Virus Disease

BY M. B. MCKAY¹ AND M. F. WARNER²

During the last half century greatly increased attention has been given to the subject of diseases of plants. One of the outstanding achievements of this period has been the discovery of the existence of plant diseases that are due to viruses. By a virus is meant a causal agent that is not visible in the juice of the plant and that has the ability to pass through filters which take out all ordinary bacteria and fungi.

Few of the virus diseases of plants can be accurately traced very far back in history. Tobacco mosaic, the first plant disease proved to be caused by a virus, was definitely noticed in 1879 (46),³ little more than fifty years ago. Peach yellows is known to date back certainly to 1791 and possibly to 1760 or even 1750 (47, p. 17-18), from one hundred and fifty to one hundred and eighty years. The potato virus diseases have a definite history of not more than thirty or forty years. Mosaic or stunt disease of rice was the first virus disease shown to be transmitted by an insect, proof of this being published in 1901 (53, 65, p. 700). Curly top of beets, tomatoes and other plants was not mentioned until about 1899 (52), and many other virus diseases of plants could be mentioned which have a yet shorter history.

It has lately been demonstrated (66) that the mosaic of tulips, commonly called "breaking," also belongs to this group of virus diseases. It happens that the tulip has enjoyed a great popularity during the better part of its history of little less than four centuries. It has given rise to a large number of books and articles and literary allusions, and the tulip mosaic, because of its striking effect on the flowers, was definitely described and illustrated from a very early period in our knowledge of the plant. Thus it is possible to trace the existence of breaking, or mosaic of tulips, back at least three hundred and fifty years, and it becomes the oldest known plant virus disease. Its long history is sufficient justification for an analysis of the most important literature on the subject.

CHARACTERISTICS OF TULIP MOSAIC

Breaking of the flower color, or rectification, has been observed practically ever since the tulip was first grown in western Europe, and until recently it was considered an indispensable feature of this flower. It is a change by which the anthocyanin pigment of the epidermis of the petal is segregated as fine featherings about the margin (Fig. 2), or in irregular stripes up the middle of each segment (Fig. 3), while between the stripes or streaks appear patches of more or less clear ground color, usually white or yellow. Seedling tulips al-

¹ Formerly Plant Pathologist, Oregon Agricultural Experiment Station.

² Bibliographer, Bureau of Plant Industry, United States Department of Agriculture.

³ Italic numbers in parentheses refer to Literature Cited, p. 211.

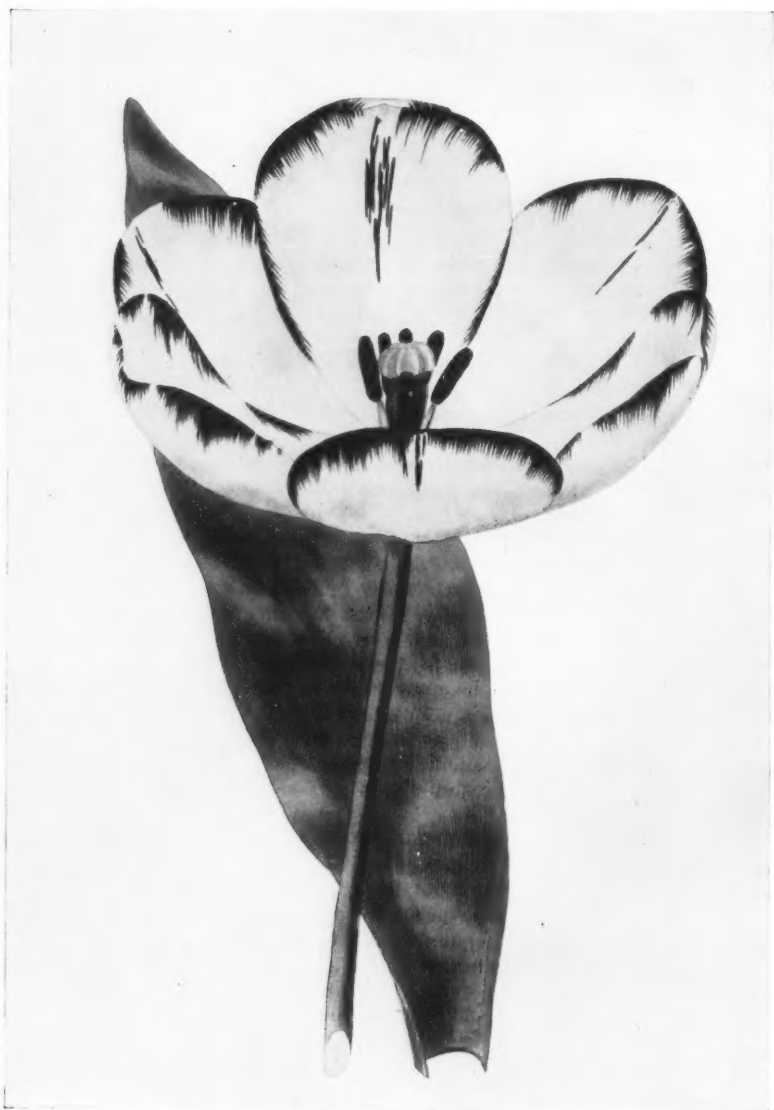


Figure 2. *Lawrance's La Joie*. After Sweet, 1831 (44, pl. 196). An example of the cup or chalice form, with a large expanse of perfectly pure ground color and exquisite neatness of feathering.

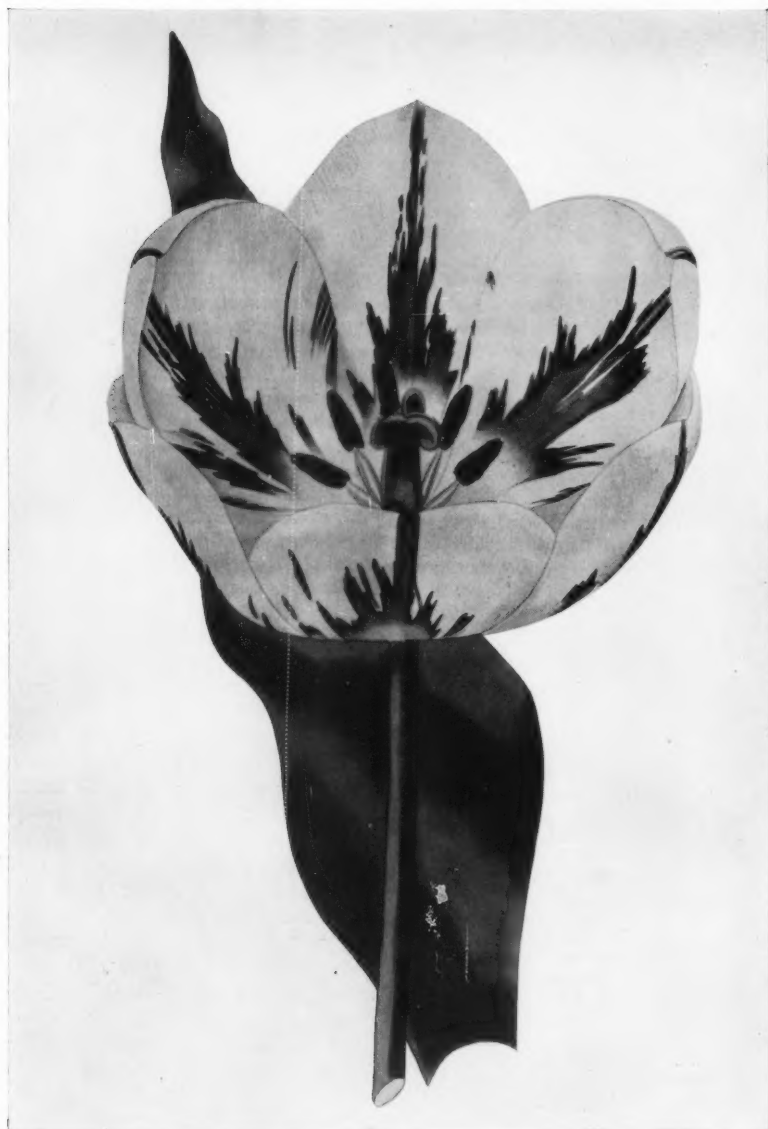


Figure 3. *Holmes's King*. After Sweet, 1830 (44. pl. 161). A "flamed" tulip remarkably free from marginal feathering. Such distinctive flames were sometimes called "arbores" (trees) by early writers.

most always produce self-colored flowers and are then called breeders. Although they may become broken at their first flowering, it rarely occurs until they have bloomed for a few years as selfs. Nor is breaking limited to varieties containing anthocyanin pigment (74, p. 101); it can also occur in clear whites or yellows, although these show little or no change in the color of the flower. But in general it may be said that the plain or self colors are the normal or primary varieties and the striped ones are aberrant or secondary.

Usually, also, a change may be observed in the tulip leaves. As stated by the late J. W. Bentley (48) in 1894:

"It is easy to tell when a breeder has broken before it blooms, for curiously enough the foliage, which is a solid shade of green so long as the tulip remains a breeder, becomes more or less mottled when the bulb has decided to produce a rectified tulip." (Fig. 4).

Further details concerning the behavior of broken tulips are given by Southwell (68):

"It is not known when nor why tulips break, although change of soil from light to heavy, coupled with a warm, dry growing season, tends to produce them. Other features of broken tulips are that they are not as vigorous, not as tall, nor as profuse in producing offsets as the breeder, while the foliage, which in the breeder is of a uniform green colour, becomes in a broken tulip mottled; and this mosaic appearance remains as long as broken tulips are reproduced by offsets. Again, two breeders of the same variety may produce flowers which exhibit quite different patterns in their colour arrangement, and as a rule the best coloured breeders produce indifferent breaks . . . A view is gradually gaining ground that a broken tulip is a sign of degeneration."

⁴ The experimental work from which these results were derived was conducted cooperatively by the Office of Horticultural Crops and Diseases, Bureau of Plant Industry, and the Oregon Agricultural Experiment Station.

SCIENTIFIC INVESTIGATIONS OF BREAKING GIVE PROOF OF THE VIRUS NATURE OF THE DISEASE

The view that breaking is a disease has gained ground rapidly in the last twenty-five years. During the latter part of this period some commercial growers have handled broken tulips as though they were affected with an infectious disease, but most people still failed to do so, though often disappointed because their tulips would become broken contrary to their wishes. Griffiths and Juenemann in 1919 (59, p. 36) were among the first to correctly list the breaking of tulips as an infectious mosaic disease and recommend the proper methods for handling it in commercial culture. Their conclusions came mainly from general observations, the performance of different stocks and comparison with mosaic diseases of other plants. In 1926 McKay (66) stated that breaking of tulips is exactly comparable to infectious mosaic diseases of other plants, and growers were advised to handle it accordingly. The methods recommended for avoiding it were segregation of affected stocks from the healthy tulips, and prompt roguing of individual diseased plants.

Progress in the investigation of plant diseases in recent years has made the true relation of disease to breaking both easy to comprehend and not difficult to prove. Positive proof of this relation was not secured, however, until 1927, fully three and a half centuries after the malady became known to man and had been definitely noted in tulip literature. As reported by McKay et al (75)⁴ leaf-mutilation and aphid-transfer inoculations in 1926 at the Oregon Experiment Station gave

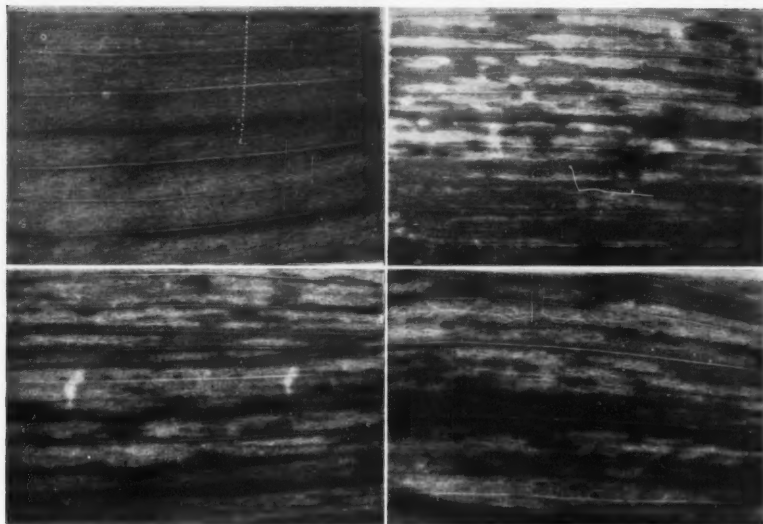


Figure 4. Portions of tulip leaves, variety *Bronze Queen*, from an experiment at the Oregon Experiment Station, showing the mottling in the foliage resulting from infection with mosaic or breaking. Upper left, healthy uninoculated control; upper right, infected by leaf mutilation inoculation from *Clara Butt Rembrandt*, and lower infected by transfer of aphids from *Clara Butt Rembrandt*. The photograph was made from leaves grown from bulbs produced by the plants the year following inoculation. In no case were any symptoms secured the year the inoculations were made.

definite transfer of the disease in controlled experiments. More extensive tests conducted later confirmed and corroborated the first results. The disease has been successfully transferred by inoculation from fifteen varieties of broken tulips, including four commercial Rembrandts (broken Darwins) and other breaks of Darwin, cottage, and breeder tulips, to the single variety *Clara Butt*, a Darwin tulip used as the standard of comparison (Fig. 5). It was in turn transferred by inoculation from *Clara Butt*, Rembrandt, to seventeen self-colored varieties. In the inoculation work suitable controls were maintained. This was usually done by taking for the experiment two bulbs from each clump produced by

one plant. The plant from one of these bulbs was inoculated and the other maintained uninoculated as a control.

Other workers also have secured definite proof of the infectious nature of the disease. In England, Miss Cayley (72, 73), in 1927, obtained infection of healthy bulbs by inserting into them tissue from diseased ones, and by grafting a portion of diseased bulb on cut healthy bulbs. Atanasoff (71) mentions infection in tulips by pricking a drop of sap expressed from diseased leaves into a healthy plant at the base of a new leaf. Symptoms were not secured until the bulbs from inoculated plants were grown the following year. All this work gives adequate proof that the breaking of



Figure 5. Tulip flowers from an experiment at the Oregon Experiment Station showing the transmission of mosaic or breaking by reciprocal inoculations between Farncombe Sanders and Clara Butt. The flower at the left is Farncombe Sanders Rembrandt grown from a commercial bulb and at the right, Clara Butt Rembrandt. The upper flowers are Clara Butt control (left) and inoculated (right) with aphids transferred on April 27, 1927, from Farncombe Sanders Rembrandt. These came from one plant two years previously, or in 1926. The lower flowers are Farncombe Sanders inoculated (left) by leaf mutilation on May 6, 1927, from Clara Butt, and control (right). Photographed April 21, 1928.

tulips is due to an infectious virus disease. The symptoms and performance classify it as a mosaic disease.

In Oregon (75) infection was readily secured by three methods of inoculation, namely, leaf mutilation, which gave thirty per cent infection; tissue insertion, thirty-three per cent; and transfer by aphids, twelve per cent. The leaf-mutilation inoculations were made by applying juice pressed out of diseased plants to the leaves of the healthy plant mutilated by crushing between the thumb and finger. The tissue-insertion inoculations were made by inserting a wedge or slice of tissue cut from a diseased flower stalk into a slit cut

in the healthy flower stalk and binding with moist raffia. The aphid-transfer inoculations were made by transferring aphids to healthy plants under cages after feeding them for some days on diseased plants. Three species of aphids, *Illinoia solanifolii* Ashmead, *Myzus persicae* Sulz. and *M. pelargonii* Sulz., were tested and found able to transmit the disease. *I. solanifolii* transmitted the disease readily and gave positive results in every case. The others gave relatively low percentages of transmission and failed entirely in some tests. In all cases no symptoms were secured the year the inoculations were made. Proof of infection was not obtained

until the following year, when the contaminated bulbs gave the typical manifestations of the disease, including reduced growth, mottled foliage, and broken flowers.

As already mentioned, Cayley (72, 73) succeeded in transferring the disease by inserting affected tissue in healthy bulbs and by bulb grafting; and Atanasoff (71) secured infection by needle-pricking drops of diseased juice into healthy plants. Thus the disease has been successfully transferred to healthy plants by six different methods. However, the only one of these that is natural is the aphid-transfer method. While it is not known if other insects are able to transfer infection, judging from what is known of other mosaic diseases it is probable that aphids are chiefly responsible for the spread of this disease among tulips. To cause self-colored tulips to break it is only necessary for the right aphids to feed on broken tulips, then on the self-colored healthy ones, after which some of the bulbs produced by the latter will give broken flowers the following year. Presumably this is what has usually happened in the past when tulips have broken either without the aid of man or following the use of some of the special methods advocated for inducing breaking.

EARLY RECORDS OF BREAKING

When identified as a mosaic disease breaking in tulips takes on fresh significance, and it adds to this interest when we find it was familiar to some of the earliest writers on the tulip. Originally it was usually called *variegation*⁵ in allusion to the streaking and blotching of the segments of the flower. So far as we can discover, the English term

"breaking" first appeared in print in 1717, in Bradley's "New Improvements of Planting and Gardening" (33, p. 114). The word "rectify," which later became common in English, had been used in French as early as 1654, in the "Floriste François" of La Chesnée Monstereul (19), who, however, did not use it precisely in the modern sense.

Early data on breaking are chiefly concerned with the coloring of the flower, and fall into four groups: (1) descriptions of and notes upon variegation, (2) varietal names of tulips suggesting flaming or feathering, (3) illustrations of broken tulips, and (4) occasional notes on other features associated with striping of the flower.

FIRST OBSERVATIONS ON VARIEGATION

The first definite record of breaking was published in 1576 by Charles de l'Ecluse or l'Escluse, better known as Carolus Clusius. His "*Rariorum Aliquot Stirpium per Hispanias observatarum Historia*" (2) has an appendix, which, while not published until 1576 and possibly not written before 1574, gives the results of observations on the tulip apparently extending over a number of years. Indeed, it may be inferred from some of his letters (43, p. 11, 47-48) that Clusius was much interested in tulips in 1567, and had considerable knowledge of their life his-

⁵ In the present article the word "variegation" is often used in abstracts and discussion of literature for striping of the flower. Tulip literature so far antedates modern scientific terminology that precise technical equivalents cannot always be substituted for the inexact popular terms so long and so generally used. Not only "variegation" but "variation" and even "variety," with their related words and equivalents in other languages, at one time commonly signified striping or mixture of two or more colors. Moreover, in connection with the tulip, these words almost always referred to the flower; up to the 19th century we have found only one instance (37, p. 56) in which the term "variegated" was applied to the leaf.

tory in 1569, although it does not appear that he possessed any of his own before he went to Austria. In this work (2, p. 513),⁶ Clusius notes the great variety of colors found in tulips, saying that one finds some flowers that are partly white and partly purple, or partly red and partly yellow or gold color, and still others with yellow or russet, white, purple or red mixed together, yet in such a way that *individual colors, distinct from each other, are mingled alternately in ray fashion*, these colors being deeper or paler, more densely or more sparsely commingled, *and sometimes even with another color, paler elsewhere, running in stripes through the middle of the petal or about its outermost edges.*

In 1573 Clusius went to Vienna (70, p. 123-124) and there met Busbecq, who had been ambassador from Ferdinand I of Austria to the Sultan Suleiman the Great in 1554-1562, and in his account of his Turkish mission (5, 1:107) has left us the first authentic record of the garden tulip. On the way from Adrianople to Constantinople in January, 1555, Busbecq saw tulips in bloom, and may possibly have brought some back with him on his return to Vienna in the fall of that year; at any rate he procured them later for various persons. Clusius received from him a lot of seeds and bulbs which he planted in 1575 and 1576 (8, p. 142-143), and, continuing his detailed observations through the season of 1582, revised his tulip data in his "Rariorum aliquot Stirpium, per Pannoniam, Austriam, &

vicinas quasdam Provincias observatarum Historia" in 1583. He found (6, p. 151, 153) that the flowers of seedlings from white parents were sometimes entirely white like those of the parent plant, sometimes pure yellow, red, or purple, and sometimes variegated in these colors. He described rather minutely over thirty obviously broken sorts (6, p. 153-161), and, while some of these descriptions are obscure, one finds such features as white petals with wide borders of crimson, or marked with purple spots or streaks, yellow petals marked with reddish rays, and other phrases indicative of feathering or flaming, while among his illustrations (6, p. 155, 158; Fig. 6), several of his "variae" crudely indicate patterns of breaking.

Although in the beginning Clusius (2, p. 513) rather loosely commented on flowers changing to various colors, he did not record the actual change from the breeder to the broken state until after he had grown tulips for himself for several seasons. At first his interest seems to have been absorbed by the infinite variety of colors and their combinations, but in his final account of the tulip (8, p. 139) he relates how in 1585 a flower that had previously been a beautiful red became variegated in red and yellow *in such a way that the yellow occupied the center of the petal, while the red, as if radiating from it, was distributed about the margin.* He also had a yellow that became yellow and red and a purple that developed *white and purple lines radiating through the petals*, but he got the idea that his bulbs were apt to decay soon after this change, and it seemed to him as if they wished to delight the eyes of their owner with their variety of

⁶ Acknowledgment is due to I. Tidestrom, Assistant Botanist, Bureau of Plant Industry, for valuable help in the interpretation of obscure Latin passages, but responsibility for the selection of material from non-English sources rests with the junior author alone.

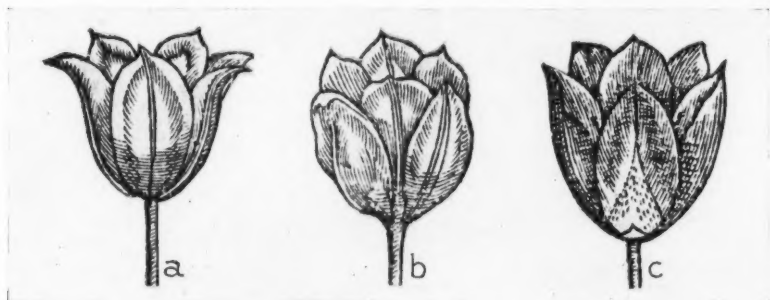


Figure 6, A, B, C. Variegated early tulips after Clusius, 1583 (6, p. 155, 158). In C is shown a curious pattern reproduced in several later works, sometimes with better execution, but with no less artificial effect. It is almost impossible to identify Clusius' figures with any of his descriptions, but this one is used by Gerard (7, p. 117-118) for a tulip "of a skarlet colour, welted or bordered about the edges with red. The middle part is like unto a hart tending to whitenesses, spotted in the same whitenesse with red speckles or spots."

color before bidding him a last farewell.

It may seem strange that Clusius did not sooner record the striking change wrought by breaking, but his early observations evidently included broken sorts as well as self colors in great variety growing side by side. Hence the mere fact of streaks and splotches need not have been surprising in itself, nor the early and gradual rectification of breeders when considered in mass. However, when by observing the performance of individual bulbs in detail he noticed a sudden transformation in a flower which for several years had been conspicuously beautiful as a self, it took on greater significance in his eyes, particularly when it also occasioned the loss of a cherished bulb.

It cannot be assumed that all of Clusius' notes on color variation, often obscure, have reference to breaking. His "variae" probably included some of the blended tints common in breeders, and his remark that the

flowers of seedlings change to various colors might indicate diversity from the parent plant as well as the breaking of breeders. There can be no doubt, however, that he refers to variegation when he mentions individual colors, distinct from each other, mingled alternately in ray fashion, and hence that there were well-marked instances of breaking among the first tulips Clusius had ever known.

His first publication on variegation was soon followed by works from other authors, giving descriptions or descriptive names of individual flowers exhibiting the striking and diversified effects produced by breaking, but there were few observations on the phenomenon in general. Lauremberg (17, p. 119), however, in 1632 concisely stated the principles of tulip coloring as red (i. e. anthocyanin) on yellow or white, the red being found sometimes about the margin, sometimes along the midrib and sometimes only on the inside of the petal; sometimes appearing in stripes, sometimes in flames, sometimes in dots.

NAMES AND DESCRIPTIONS OF BROKEN VARIETIES OF TULIPS

It was also in the year 1576, but after the first publication on breaking by Clusius, that the first Latin polynomials indicating this condition appeared in the "*Plantarum seu Stirpium Historia*" (3, p. 66-67) of Matthias de l'Obel. The latter gives a figure and brief description of the "*Tulipan sive Lilionarcissus luteus latifolius, obtusis, phoeniceis rubentibus oris*,"⁷ and lists some thirty tulip names, many of which suggest variegation. From this time forth Latin or vernacular names of tulips indicative of stripes, pencillings, or "trees" in various colors frequently occur in botanical works. But, whereas the writings of Clusius were based on his close observation, botanists with less personal knowledge of the tulip were apt to copy many of their data from others. This may even have been the case with l'Obel, also with Henry Lyte, whose English version of Dodoens, "*A Nievee Herball, or Historie of Plantes*," 1578 (4, p. 212), gives the following description suggestive of breaking:

"The great Tulpia, or rather Tulipa . . . hath at the top a faire large & pleasant flower, of colour very divers and variable . . . and *purpled about the edges or brimmes*⁸ with yellowe, white, or red, but yellow in the middle and bottome of the flower, and oftentimes blacke or speckled with blacke spotted, or mixt with white and red . . ."

Lyte may have obtained this addition to the original Dutch of Dodoens from the author himself, or from Clusius, although the tulip had begun to be cultivated in England about

1577, according to the evidence of Gerard, whose "*Herball*" (7, p. 117), published in 1597, records that James Garret of London had been growing these flowers "for the space of twentie yeeres" and "each new yeere bringeth foorth new plants of sundrie colours not before seene." Gerard also describes a number of tulips that are evidently variegated. While this does not definitely prove anything save that breaking was known to Gerard before 1597, the diversity of coloring noted by Garret throughout his experience implies that tulips may have broken immediately on being introduced into England.

ILLUSTRATIONS OF BROKEN VARIETIES

Among early evidences of breaking are many plates of rectified tulips. Variegation is not strikingly represented in the 16th century figures, but l'Obel (3, p. 66) has an illustration of a tulip with a name indicating that its petals are bordered, and Clusius in 1583 (6, p. 155, 158; Fig. 6) shows several with crude markings, doubtless intended as broken flowers. In 1601 a tiny tulip with a well defined striping appears in the engraved title of Clusius' "*Rariorum Plantarum Historia*" (8), and broken varieties became favorite subjects with artists and engravers early in the 17th century. Vallet in 1608 (9; Fig. 7), De Bry (10; Fig. 8) and Sweerts (11) in 1612, Besler in 1613 (12), and the "*Hortus Floridus*" of Crispijn van de Passe (13; Fig. 9) in 1614, all show variegated tulips, many of these plates being accompanied by polynomials descriptive of the stripings or markings of the flowers.

One of the outstanding episodes of tulip history was the "tulipomania"

⁷ Yellow broad-petalled tulip with reddish purple margins.

⁸ In this and subsequently quoted matter the italics are those of the present writers.

in Holland in 1634-1637, which was actually a colossal gambling scheme, only checked by governmental interference. Although a great deal of literature, chiefly satirical, has been written about this craze, it adds little to the history of breaking save the fact that rectified flowers were most highly esteemed. Many illustrations which have been preserved of tulips that brought large sums during the "mania" period (39; Fig. 13; 56) are of broken varieties.

An examination of the richly illustrated literature of botany shows the vogue for broken tulips continuing unabated until well along in the 19th century. Few breeders were selected for illustration, as they were regarded merely as inferior and transitional forms.

EFFECTS OF BREAKING ON STATURE, FOLIAGE, ETC.

Most of the changes in the habit of the plant which have been remarked by Southwell (68) were definitely attributed to breaking by early writers on the tulip. La Chesnée Monstereul (19, p. 76) tells us that rectified bulbs diminish in size and rarely produce offsets, while the leaves become narrower and the stem shorter; the "Traité des Tulipes" (28, p. 148) says the leaves are shorter, more pointed and yellower than those of normal plants, the stem is short and slender, supporting a puny flower bud, and the variegated sorts do not go to seed. Another late 17th century work, the "Connoissance

et Culture parfaite des Tulippes Rares"⁹ (27, p. 23-24), says some of the rectified plants do not grow so tall and are smaller in the vase or flower-cup than the self-colored ones. This general dwarfing in the habit of the striped tulips was also clearly observed by Philip Miller (35) and others.

Literature contains many allusions to striped or spotted *foliage* of tulips, but this may not always be evidence of breaking. La Chesnée Monstereul displays unmistakable knowledge of the leaf mottling characteristic of tulips afflicted with mosaic (Fig. 4) when he asserts (19, p. 114-115) that the experienced grower can always tell before a tulip blooms whether it is going to break or not, because if there are *figures on the leaves* as they emerge from the earth in spring it will surely be broken, and otherwise very rarely. Miller says in the "Gardeners Dictionary" (35) that the change is apparent long before the tulip flowers, "for all the green leaves of the plant will appear of a fainter colour, and seem to be strip'd with white, or of a brownish colour." Parkinson's "Tulipa de Caffa" (16, p. 51) suggests the effects of mosaic in other features beside its leaves, which are said to be "sometimes crumpled or waved at the edges" sometimes merely bordered and sometimes "listed or parted [i. e. striped or intermixed] with whitish yellow and greene," and he gives a figure of this striped leaf (16, p. 53), possibly copied from one in the "Theatrum Florae" (14, pl. 9; Fig. 10) representing a purple flower with whitish flames and leaves bordered with yellowish white.

Certain tulips which have been prized for their *ornamental foliage*

⁹ Sometimes credited to "N. Valnay, Controleur de la Maison du Roy," but inasmuch as he is often mentioned in the third person in the book itself, as are many other amateurs of flowers of that period, this attribution seems extremely doubtful. The original edition of 1688 has not been examined in the present study, but the late C. Harman Payne, in correspondence, is authority for its identity with that of 1696, which has a slightly changed title.



Figure 7. After Vallet, "Le Jardin du Roy" (9, pl. 72). Photographed from a reissue of about 1624, in which plates 3 and 4 are identical with 73 and 72, respectively, of the original edition of 1608. The flowers shown here are undoubtedly broken, although their patterns are indistinct, and the emphasis of the drawing is on the graceful and lifelike habit of the plants.



Figure 8. After De Bry, 1612 (10, pl. 6). Three of these flowers are identical with those of Vallet in Fig. 7 and are redrawn from them in reverse. Here, however, the pattern of the break is emphasized and elaborated, suggesting modes of marking unknown today, and possibly never actually existent save in the technique of the artist or engraver.

have not heretofore been associated with breaking, as those advertised about the middle of the 18th century by Van Kampen and Son (37, p. 56) with leaves shaded in yellow and white, and one figured in the "Florilegium Harlemense" (51, pl. 50) in 1901, with pure yellow flowers and foliage conspicuously marked in pale yellow. It is noteworthy that the term "variegation" has rarely been applied to the tulip *foliage* and was perhaps first used in this way by Van Kampen. So far as the literature indicates, these "variegated" leaves may occur without striping in the flower, and the leaf coloring is always green and yellow or white, never brownish or purplish.

Nevertheless, an alteration in the leaves so extreme as to suggest the term "variegation" might possibly be due to virus infection. In the experimental work completed at the time this review of the literature was undertaken, there was evidence of more than one, possibly three, types of mosaic disease in tulips. One of these, for convenience, was designated "Marie Stewart mosaic," merely because it was first noted in this variety. Its characteristic was a distinct break in the color of the flower but no mottling evidenced in the foliage. The second apparent type was one showing the usual broken flowers together with mosaic mottling in the foliage (Fig. 4), a mottling that was not conspicuous but could easily be discerned by examination of the leaves. This is the common form of the disease and is the one usually referred to as breaking or mosaic of tulips. The very apparent third type spoken of as "yellow mosaic" had such distinctly yellow striped and mottled foliage that it could be observed as far as the

plant could be seen, and might sometimes be considered as a case of leaf variegation. The colors in the flowers were also usually extremely broken, in Clara Butt and Farncombe Sanders at times nearly white. When inoculations were made with these three types into Clara Butt the diseases were reproduced in approximately their original form, in one case producing broken flowers without mottling in the foliage, in another broken flowers and plainly but not conspicuously mottled leaves, and in the third case, extremely mottled, yellow striped and often crinkled foliage and strikingly broken flowers. While further work is needed to clearly differentiate and define these and possibly other types of mosaic disease in tulips, it may be said that some but not all of the leaf variegation noted in tulip literature may have been due to mosaic infection, and that the extreme type may not have been common in former times, just as it is less usual than the others at the present day. The existence of more than one type of mosaic disease may also explain some of the diversity in the description of its effects by different writers. Infection by the severest type of the disease might account for the speedy degeneration or immediate death of bulbs that had just become strikingly broken, and a stock thus affected might rapidly die out, whereas it is commonly known that tulips affected by the common form of mosaic may be propagated indefinitely.

The mode of perpetuation of breaking, though not explicitly described, was implied in the early observations of Clusius (2, p. 513-514) that *offsets always have flowers of the same color as those of the parent plant, while seedlings very rarely do*

so. La Chesnée (19, p. 67-71) says the seed never produces a bulb like the one that bore it, while offsets always have the nature of the bulb that produced them; hence the seed is the means of obtaining new varieties and the offset is the means of perpetuating and multiplying the existing ones. And when the author of the "Connoissance et Culture parfaite des Tulippes Rares" (27, p. 23) states, as if it was a very unusual fact, that he has seen tulips become variegated in their first flowering, we may infer that in his time *seedlings* were supposed to have only self-colored flowers. But, in general, the mode of reproducing the characteristics of the tulip through propagation by offsets, and not by seeds, seems to have been so well known that it rarely occurred to anyone to note its special significance for the mosaic condition.

PROBABILITY THAT BREAKING EX-
ISTED IN TURKISH TULIPS BEFORE
THEIR INTRODUCTION TO
WESTERN EUROPE

The literature already quoted gives abundant proof that breaking became common as soon as tulips were grown in western Europe, and there are indications that it already existed in Turkey. From a manuscript of Muhammed Lalé-Zari (41), translated and edited by H. F. von Diez, we learn that at the beginning of the 18th century the Turks had very exacting standards of tulip beauty, many of them dealing with the proportions and patterns of rectification, which are thought to have been handed down for many generations. Although this manuscript, which is dated 1744, does not prove the antiquity of breaking in Turkish tulips, the author draws upon other writings

thought to be much earlier, and includes some ancient tulip names in his discussion of breaking, thus suggesting that this condition may have been known to the Turks before the time of our first records.

Furthermore, the first description of the garden tulip by Conrad Gesner (1, 213th leaf) suggests that the leaf mottling common in broken tulips had already been noticed. The flower Gesner saw in 1559 in the garden of Councillor Herwart of Augsburg was red, without hint of variegation, but he concludes his description of the plant with the statement that the leaves were very pale in color, and *there were as yet no spots, which are said to appear on the mature leaves.* Now this might have referred to the dots or spots caused by tulip fire, a fungus disease, and not to those due to breaking. But other allusions to tulip fire do not occur till about a hundred years later, when disease had become a recognized factor in cultivation, so it is a reasonable supposition that such dots had been noticed on the foliage in connection with the handsome markings of the flower, and were thought typical in the tulip, as indeed, they are in the common mosaic condition (Fig. 4).

Then again we have ground for supposing there may have been broken flowers among the first tulips seen by Busbecq. Too much stress should not be laid on his statement that this flower was remarkable for the "*variety and beauty of its coloring*" (5, 1:107), but the Latin adjective "*varius*" and its derivatives were usually employed for mottling, striping and other mixtures of different colors. It would be rash to accept this as absolute proof, but, inasmuch as the word was commonly used in

this sense by contemporary writers, it is very probable that Busbecq, in 1555, intended to say merely that the striking feature of the tulip was the *mixture* and beauty of its colors.

It seems inevitable that breaking must have come from Turkey with some of the first importations of bulbs. The tulips from which Clusius undoubtedly drew his original observations on variegation (2, p. 515; 6, p. 169; 8, p. 150) were those of Georgius Rye of Mechlin, which were from bulbs received at Antwerp with a cargo of cotton goods from Constantinople about 1562 (8, p. 150). As Clusius observed breaking in some of these, it must have been present in a portion of the original shipment, whence it would have been communicated to the unbroken bulbs, their offsets, or seedlings planted in their neighborhood. The mention of the many "variae" obtained from the seed Busbecq had received from Constantinople (8, p. 142-143) might imply that breaking occurred in the first flowers from Turkish grown seed, if we did not now know that the seed does not carry the infection, which can only be transmitted from neighboring diseased plants. The promptness with which imported bulbs broke in western Europe might be accounted for by infection from neighboring diseased plants other than tulips, but this seems less probable. It is more logical to assume that the malady was carried to the new country with infected bulbs from Turkey, and that it soon spread from these to self-colored varieties, including seedling tulips grown from Turkish seed. In view of recent discoveries it would only be necessary for certain aphids to feed among a few broken tulips to quickly spread the infection. And

so far as Clusius' Vienna tulips are concerned, we know he received from Busbecq (8, p. 142-143) not only seeds but bulbs, and doubtless among the latter there were enough broken varieties to infect the neighboring seedlings.

In conclusion, it may be said that while the available literature does not furnish direct proof that breaking already existed in Turkey before the tulip was known in western Europe, there is presumptive evidence that this may have been the case, and the circumstances under which it first occurred in European gardens make it almost certain that the disease was introduced with some of the earliest importations of Turkish bulbs.

THEORIES OF THE CAUSE OF BREAKING

So remarkable a transformation as the conversion of a self-colored tulip into a striped one was bound to rouse discussion and inquiry. As Needham has observed (67):

"No one knew why or when this rectifying would occur, and in that lay one of the chief charms of the flower. As a lady took off her morning gown and put on her evening dress, so the tulip appeared one time in the self-coloured garb, and another time in the rectified state of 'feathered' or 'flamed.' The cause of this extraordinary change, which was without parallel in the floral world, was not easy of discovery, nor could any reason be assigned for the 'breaking' of a breeder in any particular year."

Many theories have been advanced to account for it. Some of them were mere gardeners' superstitions, as the idea that breaking depended on the planets, and especially the moon, which was held by Reyntkens (39, p. 6-8); or that it was influenced by planting in certain signs of the Zodiac, as claimed by Heinrich Hesse

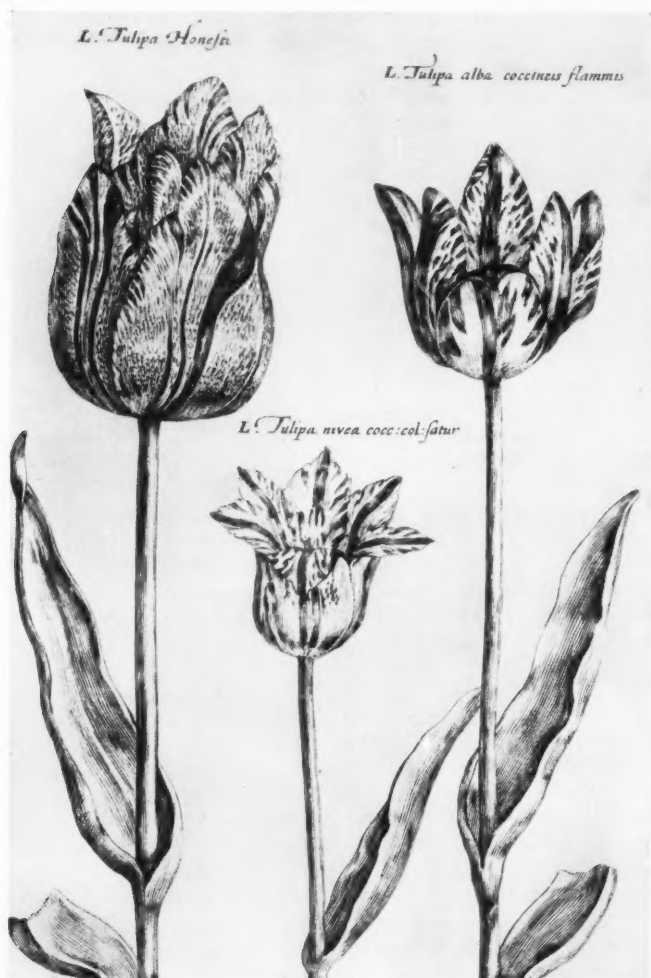


Figure 9. Tulips represented by Crispijn van de Passe the Younger in his "Hortus Floridus" (1614), photographed from "The first book" reprinted in 1928 (13, pl. 31). The largest flower is described as follows: "This first flower of tulip, known in Holland by lovers of flowers by the name Honestus after its grower . . . is wonderful from its silver colour, with varying, now narrower now broader lines running through it and indefinite spots of scarlet colour, at times also something of yellow, especially around the base."

(32, p. 43); but on the whole there is not so much of this kind of folk lore in tulip literature as one might expect. From time to time various external factors, as climate, weather, soil, or cultivation, have been suggested as the cause of breaking, but the leading theories have always implied that it was due to some quality or predisposition in the nature of the tulip itself.

LA CHESNÉE'S THEORY OF VARIEGATION

The tulip had been grown in Europe about a hundred years before the first serious consideration of the nature and causes of breaking found its way into print, in the "*Floriste François*" (19) of Charles de la Chesnée Monstereul.¹⁰ The book is permeated by an elaborate philosophy of color, supposedly applicable to all natural phenomena, but especially to the coloring of tulips, which often confuses the argument. In brief, La Chesnée (19, p. 53-54) held that the colors of tulips were controlled by the elements: air, fire, and water, which presided over the production of the seed; when the air was predominant the blue color peculiar to that element would prevail in the flower; if water was predominant the color would be white, and if fire, it would be red. But if the seed should partake of two or three elements their several colors would be commingled in the tulip. La Chesnée apparently thought rectification essential to the stabilizing of the simple or self colors as well as to the segregation of color in stripes, for he refers to

it (19, p. 110-112) as a process by which the dominant element subdues or banishes the others found in the flower; for instance, the fire may evaporate and dry up all the aqueous substance of the tulip and expel all the air, leaving the flower wholly red, or, if the tulip is chiefly controlled by the water, that element may overcome the fire and the air and make the flower entirely white. He concludes that so long as these three colors exist in tulips, they can never be constant without rectification, but are always subject to change, and the color of red, yellow, and white tulips is fixed, like that of the striped ones, *after they are rectified*. Elsewhere he says (19, p. 70-71) that when nature decrees a striped flower like a "white Paltot," the fire and water which predominate in the origin of the tulip seed will give it the colors of red and white, which will remain in balanced opposition to each other, not blending, but each one keeping its proper place, so that these two separate colors will form a "white Paltot," which will never change, but will always be the same, together with all its offsets. The striping is brought about in this way (19, p. 95-96): when the fire has more or less burned out the white and has given its own color to the petals, the white and blue become restricted to the base of the flower, constituting a "couleur" or breeder, but in course of time the blue and white reassert themselves, while the red is diminished. Then, when the bulb sends up its next flower, the three colors ascend into it together, and the combination of pencillings of different tints forms the variegation of the petals.

So much for La Chesnée's ideas of the nature of breaking. As to its

¹⁰ The imprint of the book reads: "Caen, Chez Eleazar Mangeant, M.DC.LIIII," but the "Extrait du Privilege du Roy" shows that while the authorization was granted Nov. 4, 1654, actual printing was not completed until Jan. 10, 1655.

cause, he opposes the theory that it may be due to disease, saying (19, p. 71-73) some maintain this transformation can only take place when the bulb is sickly and lacks the vigor necessary to force the coloring matter up into the flower, so that a portion thereof remains below in the bulb, leaving the flower streaked. But, he argues, if the striping were due to such infirmity, the plants would have to be continually sickly in order to retain their beauty and would lose it if they recovered their health and vigor, and inasmuch as disease would cause an imperfection in the plant, it could not produce a perfect flower; therefore, since the tulip is a perfect thing, its stripes cannot be due to disease. La Chesnée's own explanation (19, p. 73-74), which was also held by other amateurs, was that the tulip was perfected or rectified only when the bulb had reached a certain maturity, just as fruits change color as they ripen, or the hair of man becomes white in old age; and that any tulip capable of improvement would on reaching a certain age become rectified, taking on the brilliancy of coloring which would perfect it, and would thereafter remain constant, without further change. One of his reasons (19, p. 74-76) for this conclusion was that variegation occurs naturally only after the passage of some years, although it may be hastened by the arts of the grower; and another was the parallel between breaking in tulips and the age of man; as the human body is commonly shrunken in age and becomes incapable of reproduction, so the broken tulip diminishes in size, its leaves becoming narrower and its stem shorter, and it rarely produces offsets.

Hence La Chesnée concluded (19,

p. 77) that the breaking of the tulip was chiefly due to higher causes and elementary properties, and that the principles of the elements, governing and working together in the origin and development of this plant, were responsible for its variegation, because they were the principles of color. (Fig. 1).

In contrast to some of those who followed him, he associated breaking with a specially vigorous state of the plant. He definitely states (19, p. 20-22) that the French had specially studied this transformation, and through long experience had found the means of assisting nature by making the earth supply extraordinary vigor to the bulb, which could then put forth a supernatural effort, causing the tulip to break and rectify and come to its perfection of beauty.

However fantastic his theory of color may seem, we owe to La Chesnée the first statement of several important concepts in regard to breaking: (1) that striping of the tulip flower was a more or less natural physiological process depending on the maturity of the bulb; (2) that others supposed it due to a morbid condition of the tulip; and (3) that it might be influenced through the nutrition of the plant.

MATURITY OF THE BULB

Although La Chesnée (19, p. 73-77) was the first to elaborate the theory that breaking depended on maturity of the bulb, it had already been suggested in the old fancy that the finest breaks were those occurring after the tulip had bloomed for some time as a self. The idea held by Clusius (8, p. 139) and others, that when a tulip broke after some years in the breeder state it was always

followed by early loss of the bulb, was doubtless due to some notion that the plant had thus reached its adult or perfect stage rather than any real apprehension of a morbid condition. This idea that the tulip attained its perfection just as it was about to die was handed down for many generations, though it probably often had a purely fanciful or poetic significance.

La Chesnée's theory of maturity has not been generally adopted as a sole and sufficient explanation of breaking, but it has largely entered into the consideration of other theories, and a good deal of importance has been attached to it by different persons at various times. There was some reason for viewing breaking as a sign of the coming of age of the plant. Experience had taught that all tulips were subject to this transformation; it might happen after one year or twenty but it would almost inevitably occur (67). The character of the plant was not considered definitely fixed until it had broken; as expressed by Hanbury (38, p. 301), breeders were "only temporary plants." Consequently the self-colored tulips were regarded as the juvenile and the broken ones as the mature forms. One of the peculiarities that could not be explained in this way was that some tulips came of age immediately on blooming and others were very slow to do so; nevertheless this hypothesis has been rather widely accepted. At the Tulip Conference held at Regent's Park, London, May 12, 1897 (49), "Mr. Bentley was unable to suggest any explanation of the reason for tulips becoming 'rectified,' except that it was evidently a step in their maturation or history," and in reply to further questioning said that "beyond the statement that the 'breeder' stage was an immature form . . .

there was not even an intelligent theory."

The persistence of this conception of breaking down to our own times is shown by the following statement of Agnes Arber (63, p. 209) in 1925:

"The florist's-tulip furnishes perhaps the extremest example of a leisurely life-history. Seedling tulips take some years to reach the flowering stage and they are then capable, in certain instances, of remaining for more than fifty years as self-coloured 'breeders', after which they 'break'—that is to say, take on the more varied colouring characteristics of the adult form; *the breeder may be regarded as a juvenile form prolonged out of all conscience.*"

WEAKNESS OF THE PLANT

The theory which La Chesnée had most vigorously opposed proved the one destined for widest acceptance. The idea that breaking was connected with a weakness or abnormal condition was long implied in tulip cultivation, yet the conception that it was actually a disease in itself was undreamed of for more than three centuries, and the fact was not completely demonstrated until as late as 1927. But the theory of *weakness*—for one cannot properly apply the term "disease" to this condition except as viewed from the standpoint of modern plant pathology—underlies nearly all the cultural practice until toward the end of the 19th century, when it began to be recognized that there was no infallible method of inducing breaking, which, on the other hand, would happen in spite of all efforts to prevent it.

The observation of Clusius (8, p. 139) in 1585 or thereabouts, that one of his fine tulips perished soon after it had broken into stripes, is the first intimation of anything abnormal about breaking, although Clusius did not express an opinion whether the variegation was the cause or the effect of the



Figure 10. Broken tulips from "Theatrum Florae" (14, (1627), pl. 9), originally published in 1622, and recently identified by Savage (61) as the work of the painter Daniel Rabel. "Tulipa macedonica," at the left, suggests the possibility of broken foliage, both in the drawing and in the descriptive polynomial.

decay of the bulb. La Chesnée's (19, p. 71-72) opposition to the idea that breaking might be due to a weakness of the bulb shows that this idea had already been definitely considered in 1654. In 1665 appeared what is probably the first publication of this theory of weakness, coupled with an idea which was thereafter closely associated with it, that this weakness was promoted by poverty of the soil. The Latin poem "Hortorum libri IV" of René Rapin (20, p. 13) says explicitly that it is feebleness which gives its coloring to the tulip, which has a better mixture of colors when grown in poor soil. As rendered into English by John Evelyn, Jr. (20, (1673), p. 23):

"In the worst mold this flower better thrives;

"And barren earth miraculously gives

"More beauty to it; then a fertile ground.

"And when least strong, it is most comely found."

The latter part of the 17th century was rife with speculations on the causes of the breaking of tulips, as well as directions for bringing it about, most of which implied a lessening of the vitality of the plant. In 1675, Jean Laurent (24, p. 97-98) observed, as translated by Cowell (34, p. 59-60):

"The learned philosophers imagine that the variegation of tulips, and other flowers, proceeds from some weakness or distemper, and many come into that opinion."

Although he declared that all tulips would break sooner or later, Laurent offered to persons unwilling to wait for it to happen naturally, a recipe for hastening rectification by the use of strong manures, as night soil and pigeon's dung. La Chesnée, who regarded breaking as a natural process occurring only when the bulb had

reached its maturity, strongly disapproved (19, p. 176) of such practices, and the fact that most writers advised caution in their use indicates that their supposed effect consisted in reducing the vitality of the plant.

The theory that breaking was due to weakness was not, however, accepted without reservations. The author of the "Connoissance et Culture parfaite des Tulippes Rares" (27, p. 23) in 1688, was evidently familiar with the ideas of La Chesnée, but not ready to commit himself to any one of them. He says he has seen seedling tulips break in their first blooming, and he owns broken bulbs that are as healthy and vigorous as any breeder, even some that are twenty years old and show no sign of weakness, but, so far as he is able to judge from the dwarfed and less vigorous appearance of some broken plants, there may be a delicacy in the bulb of a variegated tulip, owing to the exhaustion of some very strong property which it originally possessed.

The author of the "Traité des Tulippes & de la Manière de les faire Panacher" (28, p. 147-151), also published in 1688, reconciles the idea that breaking is due to weakness with that of La Chesnée that it depends on maturity of the bulb. He recognizes the fact that it occurs naturally after the tulip has reached a certain age, which he thinks is because the bulb becomes exhausted by the production, year after year, of leaves, flowers, and seeds, and can no longer produce a flower uniform in color. It is then that nature draws upon the colors which seem to be kept in reserve in the base of the flower, and forcing them up into its segments, performs the miracle of breaking, after which she ceases from her efforts, and it is be-

cause of this exhaustion that the most beautiful tulips do not produce seed, but often die soon after breaking. He suggests several methods of hastening rectification by weakening the bulb, such as letting the plants go to seed and planting them the following year in poor or sandy soil, and frequent changes of location for tulips, to prevent their becoming too much accustomed to any environment, believing that when they were perfectly adapted to and prospered in any soil and situation they grew more vigorous, and rarely broke. On the other hand, if their vitality could be exhausted by artificial means, age would be anticipated, and breaking would speedily result.

In 1688 there also appeared the opinion of the British botanist Ray (29, p. 1147) that the variegation of tulips was more probably the *symptom of a morbid condition* than due to any luxuriance of nature. Tulip growers in England had already accepted the principle of weakening bulbs to induce variegation, by setting breeders first in very poor, and the next year in very rich soil. John Rea (21, p. 72) in 1665 gave careful instructions on raising tulips from seed and the selection of promising seedlings, saying that flowers of "Orenge, Brimston, Hair, Dove, Gredeline, Isabella, Shamway, or any other light or strange colour" were apt to change into handsome stripes, and concluding as follows:

"To hasten which effect, let such of your colours [i. e., breeders] as are strong and luxuriant, be set in lean and hungry, but fresh ground, and the next year after in that which is fat and well manured; and so yearly removed to contrary soils, untill you obtain the end desired. . . . The like course is held with off-sets, to cause them to alter from the original."

Samuel Gilbert (26, p. 85) in 1682

similarly advised that selfs be set "in as barren earth one year as would but keep them alive, and in the other extrem the next, to force to varigate."

Richard Bradley seems to be the first British author to discuss the causes of breaking in detail. In his "New Improvements of Planting and Gardening" (33, p. 114-115), 1717, he ascribes it to weakness resulting from lack of nourishment, as follows:

"The plainness of their colours I suppose to proceed from a strength of nature, as we are sure the *variegations of all flowers are the effects of weakness and want of nourishment*; for whoever has cultivated those sorts of tulips which are call'd breeders must know they are of plain colours, and are always large tall blowing flowers, 'tis from those breeders are commonly produced the flowers of the greatest value for their stripes sake; now and then one of them breaking (as they term it) into beautiful mixtures of colour or variegations. This alteration of tulips is reckon'd by the gardeners to be the effect of chance; but I believe the two following observations will explain the mystery. Near Bruxeles, a man is famous for a little spot of ground, in which, by some strange virtue, (as is reported) these breeding tulips change themselves into fine variegated flowers, insomuch that their roots are brought thither from several parts, to be educated and brought up for the nicest collections, and money given for their standing. In that place it is rare if three in five do not break into stripes, the first year after they are planted; but this alteration I think may be accounted for, by examining the soil, which is nothing but common rubbish sifted; or at most there is not one twentieth part of it natural soil.

It is very plain that a soil of this nature must impoverish the roots that are set in it, and consequently the flowers must some way or other show the distemper of the roots from whence they spring."

In the following passage Philip Miller (35) expresses his belief that rectification is either the symptom or the cause of weakness in the tulip:

"This alteration in the colour of these flowers may be seen long before they are blown, for all the green leaves of the plant

will appear of a fainter colour, and seem to be strip'd with white, or of a brownish colour, *which is a plain proof that the juices of the whole plant are alter'd*, or at least the vessels through which the juice is strain'd, so that hereby particles of a different figure are capable of passing through them, which, when enter'd into the petals of the flower, do reflect the rays of light in a different manner, which occasions the variety we see in the colours of flowers . . . This breaking of the colour in flowers proceeds from weakness, or at least is the cause of weakness in plants; for it is observable that after tulips are broken into fine stripes, they never grow so tall as before, nor are their stems, leaves, or flowers so large; and it is the same in all other variegated plants and flowers whatever, which are also much tenderer than they were before they were strip'd . . . though indeed, the striping of tulips doth never occasion so great weakness in them; the greatest effect it hath on them, is in lessening their growth, causing some (which while they continued in their original plain colours, did rise near three feet in height), to advance little more than two feet, after their colours were alter'd, and the more beautifully their stripes do appear, the shorter will be their stems, and the weaker their flowers."

It is noteworthy that Miller discriminates between breaking as the *result* of weakness and breaking as the *cause* of weakness. His inclination toward the latter theory, and his attempt to explain the effect of the mosaic on the entire tulip plant, although existing knowledge did not enable him to do it adequately, show a more advanced point of view than is found among his forerunners, or most of his successors. In effect, he regarded striped flowers, mottled foliage, and the like, not as immediate results of weakening the bulb, but as *symptoms of some disorder that caused weakness in the plant*. Consequently, he did not advocate planting breeders in impoverished soil. While breaking was inevitably accompanied by some degree of weakness, Miller thought it was not to be secured by

depriving the tulip of nourishment, but rather by giving it the stimulus of different soils. On the other hand he did not believe, with La Chesnée (19, p. 21-22) and, at a later date, Loiseleur-Deslongchamps (42), that rectification was due to specially good nutrition of the plant; but he seems to have followed the author of the "Traité des Tulipes" (28, p. 151) in the notion that tulips broke more readily if they did not become too well accustomed to their environment, for he says (35):

"All that can be done by art, is, to shift the roots every year into fresh earth, and a different situation, by which method I have had very good success. . . . Although it is generally agreed, that lean, hungry, fresh earth doth hasten their breaking, and cause their stripes to be the finer, and more beautiful; yet, if they are every year planted in the same sort of soil, it will not have so much effect on them, as if they were one year planted in one sort of earth, and the next year in a very different one . . ."

William Hanbury (38, p. 301-302) regarded breaking as a "disease" in the sense of chronic weakness caused by poverty of the soil. He says: "All variegations are diseases in a plant, and *nothing is so proper to bring this about as a defect of nutriment*," which "occasions a weakness; and that weakness will soon after be attended with those sickly, but to us very desirable, symptoms of different colours breaking out by various stripes in the natural one," and furthermore, "*While they are whole blowers, they are sound, and free from all disorders; when their beautiful stripes appear, the disease shows itself*; and when they have taken sufficient hold of the plant it becomes chronic, and is not in the power of after management to remove." He prescribes planting the bulbs first "in a lean, hungry, or gravelly soil," and afterwards re-



Figure 11. "*Tulipa variegata*" after Robert (22), "*Variae ac multiformes florum species expressae ad vivum et aeneis tabulis incisae*," 1665. The plates of this collection are redrawn in reverse from an earlier series by Franciscus Curtius (or Francesco Curti), published at Bologna about 1640, but are superior to the originals in workmanship and beauty.

planting each year in a different kind of earth to make them break, but Hanbury recommends that tulips, after they are broken, should always have a rich soil, "to keep them if possible in a state of luxuriance," because their natural forces have been "*diminished by the weakness that has brought on the variegation*," and it is necessary "to support them (as it were) in their *afflicted state*."

Thus it may be seen that between Clusius in 1585 and La Chesnée in 1654 the germinal idea of the weakness of rectified bulbs had grown into a more or less definite theory that breaking was due to weakness; and between John Rea in 1665 and Hanbury in 1770 the popular practice of weakening tulips to hasten rectification had led up to a well defined concept of breaking as a morbid or abnormal condition caused by defective nutrition of the plant. On the whole there has been little real progress in knowledge of the subject from the latter date until very recently. The annual change of soils recommended by Miller and Hanbury gradually ceased to be regarded as a specific method of securing rectification, but the notion that poor soils would cause it has been more persistent. In 1792 Maddock (40, p. 65) noted that forty out of fifty breeders had broken in one season, owing to their being planted in a dry, poor soil, and the starvation of tulip bulbs to make them break was still the prevailing practice in 1851, as we learn from Maund (45):

"The propagation of the tulip from seed involves no great amount of horticultural knowledge; but to develop the value of such seedlings—to 'break' them, as it is technically termed . . . is an art of which little is known. . . . These beautiful pencilings of the flower are dependent on the plant being placed in a state of health dif-

fering from that which it attains under common circumstances in its native localities. *This abnormal state is said to be effected by cultivation, or rather by starvation, in poor soil*; but at present such cultivation is a mode of proceeding guided by no fixed principles . . . which sometimes, after a series of years, proves itself efficient by chance.

. . . Propagators are unanimous in their opinion that seeds obtained from striped and marked flowers . . . produce an offspring inferior to those which are raised from flowers unbroken, and more truly in their natural state. This is good evidence, that the flower *when perfected in the estimation of the florist, is the production of an enfeebled plant*."

The conception of breaking as an "afflicted state" has been more or less consistently held down to very recent times. While there was considerable advance in knowledge of the characteristics of the condition, it did not lead to any clear idea of its true status until after the beginning of the 20th century. The whole question could have been summarized in 1900 as completely as it had been in 1688 in the conclusion of John Ray (29, p. 1147) that the striping of tulips was the *symptom of a morbid condition* rather than a freak of luxuriant nature. The symptoms became very well known, but their true significance could not possibly be grasped until the modern conception of the virus diseases of plants had been developed.

SUPPOSED EFFECT OF CLIMATE, CULTIVATION, ETC.

We have yet to consider briefly a few other alleged causes of breaking. The possible effect of different soils has been noted in connection with the theory of weakness of the plant. Certain other external factors, as weather, climate and cultivation, have undoubtedly had some influence on breaking. Although they could not

have originated the infection, they may have helped to spread it or hastened its progress. However, there are wide differences in the interpretation of climatic influences. The idea of Hesse (32, p. 43) that humidity was unfavorable to breaking was precisely opposed to that of the author of the "Traité des Tulipes" (28, p. 146-147), who says that according to those who have seen the tulip in the land of its origin, it grows vigorously and shows few breaks in Turkey, which is warm and dry, but breaks more frequently on being transported into Flanders and France, which are colder and more moist. He also thinks that tulips grown in well prepared soil and fully exposed to the sun are rarely variegated, hence he concludes that coolness and moisture are conducive to breaking. Another possible allusion to the effect of climate is the assertion of Nicolaes Wassenauer (15, p. 10) that in their native country there were only red and yellow tulips, but they became variegated in the Netherlands because of their being moved or transplanted. This might refer to their importation from the Levant into an alien climate, but more likely, as Solms-Laubach (50, p. 59) interprets it, to the excellent cultivation of the Netherlands. Moreover, Wassenauer must have been mistaken in his facts, as it is most probable that mosaic disease must have already existed in Turkey and been present in some of the earliest lots of bulbs brought from thence into western Europe.

But if Wassenauer was referring to cultural practices, he was only one of many who have associated breaking with the lifting of bulbs and renewal of soils each year. Even as late as 1918 Jacob (58) hazarded the opinion

that frequent moving might be the cause of rectification, basing it on the fact that certain tulips that had remained selfs for a long period during which they were undisturbed, broke soon after being transplanted into new situations. His account, however, suggests that the former localities may have been isolated, while the gardens into which these selfs were removed, if they already contained other tulips, might easily have furnished both mosaic infection and insect carriers to spread the disease. The early writers were not explicit about lifting as a cause of breaking, though some of them thought the lack of it would make broken flowers revert to plain colors. La Chesnée (19, p. 57-59) claimed that without lifting they would degenerate and lose their beauty and luster, and that unless the bulbs were transplanted every year, fresh earth must always be supplied to the beds. Ray (29, p. 1147) and Bradley (33, p. 115) held that broken tulips left in one spot without cultivation would go back to plain colors. Loiseleur Deslongchamps (42), who thought the striping due to a surplus of nourishment in the soil rather than to a weakness in the plant, held that repeated transplanting, fresh earth and thorough cultivation were the chief factors in breaking, while tulips left in the same place without cultivation would continue of single colors because they soon exhausted the fertility of the soil. Both Miller (35) and Hanbury (38, p. 301) recommended planting breeders in a different kind of soil each year to make them break, although Miller stated emphatically that "if one of these flowers is quite broken (as it is termed) it will never lose its stripes." Several supposedly

authentic cases of reversion to the breeder form were cited in 1925 by Needham (64), who considers this highly improbable, as does Hall (74, p. 100), but the latter suggests the fact that broken flowers become more and more suffused with color as they age may easily have been mistaken for a return to the breeder state.

GENETIC THEORIES OF BREAKING

As a genetic question tulip mosaic seems to have received little attention. Linnaeus (36) thought striped tulips must result from crossing selfs of different colors. By Solms-Laubach (50, p. 70-71) breaking was definitely, and by De Vries (54, p. 491; 55, p. 323) inferentially classed as bud variation. Southwell (68) remarks on the inaccuracy of the common term "sport" for broken tulips, which cannot be new varieties, as the same tulip often exists both in the breeder and the broken state. Hall (74, p. 103-104) emphasizes the fact that "the change is not 'sporting' in the ordinary sense," and that it is not inherited. Becker (60) and others consider it due to somatic segregation, but Chittenden (69) excludes it from this class of phenomena, because the variegation is "induced by some physiological action," and is not heritable.

METHODS SUGGESTED FOR INDUCING BREAKING

During the centuries in which variegated tulips were in high favor many devices were tried to bring about breaking of the bulbs. Although most of them cannot have had much effect on breaking, and only one of them, as will be seen later, can possibly have transmitted it, they comprise many interesting bits of lore. One of the best known items in tulip

literature is the cryptic direction of La Chesnée (19, p. 174-175) for bringing tulips to their perfection. This has been several times reprinted and translated into various languages, being fairly rendered into English in "The Dutch Gardener" of Van Oosten (31, p. 185) as follows:

"If you increase the strength of your mother by feeding her with the ashes of her bones and the substance of her father, then you will possess the land of promise, wherein udders of milk shall be, and rivers of wine, and other liquors of several colours shall flow across. Many rocks of gold shall be dispersed therein, and the ground shall be filled up with oysters, that shall discharge their red carmasin on the ground, and bring their purple to light, and if you will follow the fashion, the milk of the udders shall be turned into liquor of saffron, which shall give you golden flowers."

Which is to say, substantially, that tulips will break if planted in a sandy soil and sunny situation!

The methods most often recommended, for inducing tulips to break, by planting them in particular soils, usually poor ones, and by the application of strong manures, have already been mentioned under the theory of weakness, from which they are almost inseparable. It only remains to be said that while the soil requirements of the tulip have always received much attention, it has more and more been recognized that, although certain localities and environments undoubtedly favored breaking, no special soil would either insure or prevent it. Although soil, cultivation, or the use of certain fertilizers, may have made the plants more or less susceptible to the attack of the disease, they could not have caused it in the absence of the transfer of the virus by the necessary insects. And in such places as that mentioned by Bradley (33, p. 114) whither tulips were sent "to be educated and



Figure 12. *Diana* and "The Widow," broken tulips figured by Maria Sibylla Merian (25, fasc. 1, pl. 6) in 1860. Both in the loosely flaring type of flower and the irregularity of the pattern, these are in strong contrast to the formal types of the 19th century, represented by Fig. 2 and Fig. 3.

brought up for the nicest collections," it is probable that such insects were present in large numbers, as also mosaic diseased tulips to serve as sources of infection for the breeders.

Some very fantastic methods of inducing rectification were proposed in the earlier days of tulip growing. The one noted by Laurent (24, p. 98) and Cowell (34, p. 60) of mixing pigments with the soil in which tulips were planted was doubtless a survival of very ancient agricultural superstition. Ferrari (18, p. 462) gives a process of treating tulip bulbs with pigments, said to be derived from the Geoponica, but it is not clear whether this was supposed to make them break, or merely to heighten the color of the flower, as was Rea's process (21, p. 71) of "taking up the roots a little before they come to flower, and laying them in the sun, to abate their luxury, and cause them to come better marked the year following." Although the immediate object of this was to weaken the bulbs, it was not intended primarily for breeders, but for breaks that were muddy in color or indecisive in pattern.

BULB GRAFTING ADVOCATED IN 1675

However absurd it may have seemed to intervening generations, there was one of the old methods of inducing breaking which was in accord with our modern understanding of the disease. The process described by Blagrove (23, p. 10-12) in 1675, which consisted in joining together the cut surfaces of bulbs of different varieties, carefully halved, was thought rankest quackery by some, but it was in fact a process of bulb grafting, and although the author does not give details about the varieties used

or the results obtained, it probably often succeeded in producing new breaks. Miss Cayley (72, 73) of the John Innes Institution has demonstrated recently that bulb grafting is effective in transferring mosaic infection to healthy tulips, using a method identical in its essentials with that advocated by Blagrove. As his book is believed to furnish the oldest record of an effective method of inoculation with a plant virus, we quote his directions at some length:

"An approved way to make any tulip of what colour you please, never before now printed.

* * * * *

"Now to perform this you must have a very sharp thin knife, and some cruel, yarn or worsted, which must be to binde the tulips when cut; then get some of your finest sort of clay, and mix it well with cow-dung, let it be of an exact temper, neither too limber nor too thick. Now having all your things ready, being two of you together, match out certain roots of tulips, which are of one nature, their leaves coming alike, and blow at the same time and season, and as near as you can guess, of one forwardness, and one bigness. I shall only instance two sorts of tulips, which are your yellow crown or fool's coat and white crown, which are of one nature, that is, the make of the tulip is alike, and come always together. Having now chose out certain roots of one bigness, length and forwardness of each sort, take your knife and cut the tulip as exactly as can be possible just in the middle of both your roots, and slit the very spindle of each; then immediately clap them up together, that is, one half of the yellow crown, and the other half of the white crown; do not leave them open when you have slit them, but hold them together till you have all your things ready, for if the least wind take them they will not joyn; then when all is ready, take you half the yellow crown, and give your companion half the white crown; then having regard to the spindle, be sure to clap or joyn them exactly; then with your cruel, or yarn, or worsted, tie the root very firm together; then clay them up very well all



Figure 13. *Semper Augustus*, as represented by Buc'hoz, 1781 (39, pl. 40). The colored plate shows dark crimson stripes interspersed with bluish gray tones on a white ground. This variety came into prominence in 1623 and continued to bring enormous prices throughout the "mania" period, a single bulb being sold for 4,600 florins, about \$1,840..

over; and lay them by for a week or ten days; then cut the clay from the bottom and top, that so the roots may shoot out, and the spindle also, for the roots and the spindle will be very faint for the first year; as soon as you have cut the clay from the top and bottom, set them into the ground, and cover the earth, so that the frost may not frieze the earth about them; for if they be frozen all your labour is lost, they seldom come up with more than one leaf, for the first year, for very little more than the spindle of your root joyns together, without the roots match very exactly; but we never regard only the spindle joyning, *which causes the alteration of the flower*; you will find the roots not like other of sets, for these will be long like a datestone; when you have taken them out of the ground, put them into sand, that so the wind may not come at them to shrink them."

CONCLUSIONS

The literature of tulip mosaic is very extensive and references might be multiplied almost indefinitely, but the foregoing should serve to establish the following facts. Breaking in its aspect of variegation was definitely described in 1576; its existence before 1573 in the collection of Rye of Mechlin, which originated with Turkish bulbs about 1562, indicates that it was introduced from Turkey, where, moreover, it was probably observed by 1555 or earlier. The other characteristics of broken tulips had all been recorded by the middle of the 17th century, including dwarfness of habit, mottled foliage, reduced production of seeds and bulbs, and the fact that the broken condition is only reproduced by the offsets and is not carried in the seeds, which always give rise to plants with self-colored flowers, which, however, are likely to become broken in their turn after an uncertain length of time. The obser-

vation of these phenomena, formerly unexplainable, occasioned many fantastic ideas of the nature and cause of breaking. But when considered from the standpoint of an infectious disease of the mosaic type, every known characteristic of the abnormality is easily understood and in entire harmony. Except for its striking color effects in the flowers, the breaking of tulips is exactly comparable to the behavior of mosaic as known in other plants, the apparent difference being due to the colors of the flowers themselves and not to the nature of the disease or virus.

The cultural problem of three centuries is thus explained, but not, however, entirely solved. Tulip literature shows that until recently no one cared for any save rectified tulips, but the 20th century has witnessed a gradual but complete reversal of popular taste in this regard. With the development of the Darwins and other handsome selfs there has grown up a strong preference for self-colored tulips for mass planting, and in the last few decades these have come to be prized for their beauty above the striped ones. So that whereas tulip growers formerly strove to hasten the process of breaking and to secure as many breaks as possible, they are now equally anxious to avoid them. When it comes to be realized by the general public that broken varieties are merely mosaic diseased tulips, and that planting them in the neighborhood of selfs exposes all the latter to breaking also, it is likely that these abnormal sorts will suffer a still greater decline in popular favor, which in turn should be a valuable factor in the control of the disease.

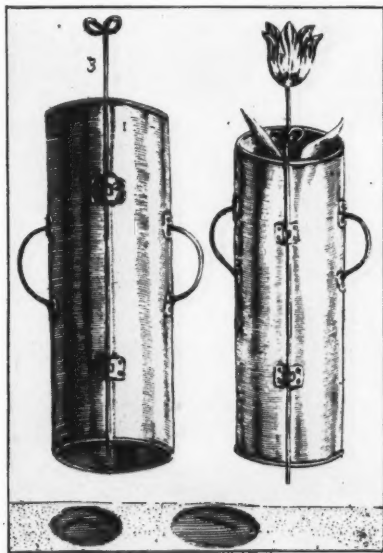


Figure 14. An old Dutch transplanting tool. After Savage in "Gardeners' Chronicle" (62). From a rare tract on tulip growing by Crispijn van de Passe the Younger, occasionally found with his "Hortus Floridus" (1614). This implement was specially useful when moving bulbs in full bloom for exhibition purposes, but whereas it was the object in those days to cherish and display these broken flowers, at the present time they are taken up and discarded by commercial growers to safeguard their self-colored tulips.

LITERATURE CITED

- (1) 1561. Cordus, Valerius.
In hoc volumine continentur Valerii Cordi . . . Annotationes in Pedacij Dioscoridis . . . De materia medica libros V . . . Item Conradi Gesneri De hortis Germaniae. 301 numb. 1., illus. Argentorati.
- (2) 1576. L'Ecluse, Charles de.
Rariorum aliquot stirpium per Hispanias observatarum historia. 529 p., illus. Antverpiae.
- (3) 1576. L'Obel, Matthias de.
Plantarum seu stirpium historia. 671 p., illus. Antverpiae.
- (4) 1578. Dodoens, Rembert.
A nieuwe herball, or Historie of plantes. First set foorth in the Doutche or Almaine tongue . . . And nowe first translated out of French into English by Henry Lyte. 779 p., illus. London.

- (5) 1581. Busbecq, Ogier Ghislain de.
Itinera constantinopolitanum et amasianum. 167 p. Antverpiae.
[Cited from English translation as follows:]
——— The life and letters of Ogier Ghiselin de Busbecq
. . . by Charles Thornton Forster . . . and F. H. Blackburne
Daniell. 2 v. London, 1881.
- (6) 1583. L'Ecluse, Charles de.
Rariorum aliquot stirpium, per Pannoniam, Austriam, & vicinas
quasdam provincias observatarum historia. 776 p., illus.
Antverpiae.
- (7) 1597. Gerard, John.
The herball, or General historie of plants. 1392 p., illus. London.
- (8) 1601. L'Ecluse, Charles de.
Rariorum plantarum historia. 364, ccclviii p., illus. Antverpiae.
- (9) 1608. Vallet, Pierre.
Le jardin du roy très chrestien Henry IV. 73 pl. Paris.
——— Le jardin du roy très chrestien Loys XIII. 81 pl
Paris [1624].
- (10) 1612. Bry, Johann Theodor de.
Florilegium novum. 141 pl. [Oppenheim], 1612 [-1614].
- (11) 1612. Sweerts, Emmanuel.
Florilegium. 110 pl. Francofurti ad Moenum.
- (12) 1613. Besler, Basilius.
Hortus Eystettensis. Classis verna . . . Ordines collectarum
plantarum vernalium I-IX. [Unnumbered plates with text on
verso.] Norimbergae.
- (13) 1614. Passe, Crispijn van de.
Hortus floridus in quo rariorum & minus vulgarium florum
icones . . . secundum quatuor anni tempora divisae exhibentur.
Arnhemij. [Not seen; cited after the following:]
——— Hortus floridus. The first book. Contayninge a
very lively and true description of the flowers of the springe.
41 pl. London, 1928.
- (14) 1622. [Rabel, Daniel.]
Theatrum florum. 69 pl. Paris. [Not seen; cited after the
following:]
——— 69 pl. Paris, 1627.
- (15) 1625. Wassenauer, Nicolaes van.
Historisch verhael alder gedenckwaardighe geschiedenissen.
T'neghenste deel [April-Sept., 1625]. 154 numb. 1. Amsterdam.
- (16) 1629. Parkinson, John.
Paradisi in sole paradisus terrestris. 612 p., illus. London. [Cited
from verbatim reprint as follows:]
——— 612 p., illus. London, 1904.
- (17) 1632. Lauremberg, Peter.
Apparatus plantarius. 168 p., illus. Francofurti ad Moenum.
- (18) 1633. Ferrari, Giovanni Battista.
De florum cultura libri IV. 522 p., illus. Romae.

- (19) 1655. La Chesnée Monstereul, Charles de.
Le floriste françois. 250 p. Caen, 1654. [Title dated 1654;
printing actually completed Jan. 10, 1655.]
——— Ed. 2, 250 p., front. Rouen, 1658.
- (20) 1665. Rapin, René.
Hortorum libri IV. Cum disputatione de cultura horticorum.
219 p. Parisiis.
——— of gardens. Four books first written in Latine
verse . . . And now made English by J. E. [John Evelyn, jr.]
237 p. London, 1673.
- (21) 1665. Rea, John.
Flora, seu De florum cultura. 239 p., illus. London.
- (22) 1665. Robert, Nicolas.
Variae ac multiformes florum species expressae ad vivum et
tabulis aeneis incisae. 31 pl. Romae.
- (23) 1675. Blagrove, Joseph.
New additions to the art of husbandry. 136 p. London. *With
his* The epitome of the art of husbandry . . . By J. B. Gent
London, 1675.
- (24) 1675. Laurent, Jean.
Abrégé des arbres nains et autres. 142 p. Paris.
- (25) 1680. Merian, Maria Sibylla.
Neues blumenbuch. 31 pl. Nürnberg.
- (26) 1682. Gilbert, Samuel.
The florists vade-mecum. 252 p. London.
- (27) 1688. Anonymous.
Connoissance et culture parfaite des tulippes rares [etc.] Paris.
[Not seen; cited after the following:]
——— Connoissance et culture parfaite des belles fleurs.
Des tulipes rares [etc.] 142 p. Paris, 1696.
- (28) 1688. Anonymous.
Traité des tulipes & de la manière de les faire panacher. *In*
Boyceau de la Baraudière, Jacques. Traité du jardinage. p.
143-152. Paris, 1688.
- (29) 1688. Ray, John.
Historiae plantarum tomus secundus. p. 985-1944. London.
- (30) 1695. Reyntkens, J. B.
Den sorghvuldighen hovenier. Druck 2, 116 p., illus. Ghendt.
- (31) 1703. Oosten, Hendryck van.
The Dutch gardener: or, The compleat florist . . . Written in
Dutch . . . and made English. 291 p., illus. London.
- (32) 1710. Hesse, Heinrich.
Teutscher gärtner. Des ersten buchs erster theil, 128 p., illus.
Leipzig.
- (33) 1717. Bradley, Richard.
New improvements of planting and gardening . . . Part 2, 136
p., illus. London.

- (34) 1730. Cowell, John.
The curious and profitable gardener. 126, 67 p. London.
- (35) 1731. Miller, Philip.
The gardeners dictionary. Unpaged. London.
- (36) 1744. Linné, Carl von.
Dissertatio botanica de peloria. (Daniel Rudberg, respondent.)
18 p., illus. Upsaliae. [Also reprinted as follows:]
——— Amoenitates Academicæ 1:280-298, illus. Lug-
duni Batavorum, 1749.
- (37) 1760. Kampen, Nicolas van, et fils.
Traité des fleurs à oignons. 117 p. Harlem.
- (38) 1770. Hanbury, William.
Complete body of planting and gardening. Vol. 1, 885 p., il-
lus. London.
- (39) 1781. Buc'hoz, Pierre Joseph.
Collection coloriée des plus belles variétés de tulipes. 40 pl. Paris.
- (40) 1792. Maddock, James.
The florists directory. 272 p., illus. London.
- (41) 1815. Muhammad Lalé-Zari.
Vom tulpen- und narcissen-bau in der Turkey, aus dem türk-
ischen . . . übersetzt . . . von Diez. 40 p. Halle & Berlin.
- (42) 1819. Loiseleur-Deslongchamps, Jean Louis Auguste.
Tulipe de Gesner. Tulipa gesneriana. Herb. Gén. Amat. t.3,
pl. 177-180 [with 10 unnumb. p. text].
- (43) 1830. L'Ecluse, Charles de.
Epistolæ ineditæ. Ex archetypis edidit . . . Lud. Christ.
Treviranus. 62 p. Lipsiæ.
- (44) 1830. Sweet, Robert.
The florist's guide. Vol. 2, pl. 101-200. London, 1829-32.
- (45) 1851. Maund, Benjamin.
The botanic garden. Vol. [13], no. 1248, illus. London.
- (46) 1886. Mayer, Adolf Eduard.
Ueber die mosaikkkrankheit des tabaks. Landw. Vers. Sta.
32:451-467, illus.
- (47) 1888. Smith, Erwin F.
Peach yellows: a preliminary report. U. S. Dept. Agr. Bot.
Div. (Sect. Veg. Path.) Bul. 9, 254 p., illus.
- (48) 1894. Bentley, James W.
The florist's tulip . . . Properties of the tulip. Jour. Hort. (3),
29:400-401.
- (49) 1897. Anonymous.
The tulip conference at Regent's park. Gard. Chron. (3),
21:341-342.
- (50) 1899. Solms-Laubach, Hermann, graf zu.
Weizen und tulpe und deren geschichte. 116 p., illus. Leipzig.

- (51) 1901. Anonymous.
Florilegium harlemense . . . Colored plates with descriptions of bulbous and tuberous rooted plants published under the auspices of the council of the "Algemeene vereeniging voor bloembollencultuur." 60 pl. Haarlem.
- (52) 1901. Linhart, György, and others.
Die californische rübenkrankheit. Oesterr.-Ungar. Ztschr. Zuckerindus. und Landw. 30:26-42, illus.
- (53) 1901. Takami, N.
Stunt disease of rice and *Nephotettix apicalis*. Jour. Agr. Soc. Japan 241:22-30. [In Japanese; cited after Kunkel, L. O. Studies on aster yellows. 1926, q. v.]
- (54) 1901. Vries, Hugo de.
Die mutationstheorie . . . Bd. 1. Die entstehung der arten durch mutation. 648 p., illus. Leipzig.
- (55) 1905. — Species and varieties, their origin by mutation. 847 p., illus. Chicago.
- (56) 1909. Murray, W. S.
The introduction of the tulip, and the tulipomania. Jour. Roy. Hort. Soc. 35:18-30, illus.
- (57) 1912. Jacob, Joseph.
Tulips. 116 p., illus. London.
- (58) 1918. — Tulip notes; suggestions about rectification and arrangement. Garden [London] 82:304.
- (59) 1919. Griffiths, David, and Juenemann, H. E.
Commercial Dutch-bulb culture in the United States. U. S. Dept. Agr. Bul. 797, 50 p., illus.
- (60) 1922. Becker, Josef.
Ueber vegetative bastardspaltung. Ztschr. Pflanzenzücht. 8:402-420, illus.
- (61) 1923. Savage, Spencer.
Early botanic painters. No. 6. Daniel Rabel. Gard. Chron. (3) 73:336-337, illus.
- (62) 1923. — A rare early tract on tulip growing. Gard. Chron. (3) 73:31, illus.
- (63) 1925. Arber, Agnes.
Monocotyledons; a morphological study. 258 p., illus. Cambridge, [Eng.]
- (64) 1925. Needham, Charles W.
The breaking of tulips. Garden [London] 89:599-600, 617-618, illus.
- (65) 1926. Kunkel, Louis Otto.
Studies on aster yellows. Amer. Jour. Bot. 13:646-705, illus.
- (66) 1926. McKay, Marion Bertice.
Narcissus and tulip diseases. Oregon State Hort. Soc. Ann. Rpt. 18:137-150, illus.

- (67) 1926. Needham, Charles W.
The breaking of tulips. [Abstract of lecture before the Wakefield Paxton Society]. Gard. Chron. (3) 79:298-299.
- (68) 1926. Southwell, H.
Tulips. Jour. Min. Agr. [Gt. Brit.] 33:607-624.
- (69) 1927. Chittenden, Reginald John.
Vegetative segregation. Bibliog. Genetica 3:355-442, illus.
- (70) 1927. Hunger, Friedrich Wilhelm Tobias.
Charles de l'Ecluse. 445 p., illus. 's-Gravenhage.
- (71) 1928. Atanasoff, Dimitar.
Mosaic disease of flower bulb plants. Izv. B'lgarsk Bot. Druzh. (Bul. Soc. Bot. Bulgarie) 2:51-60, illus.
- (72) 1928. Cayley, Dorothy M.
"Breaking" in tulips. Gard. Chron. (3) 83:435-436, illus.
- (73) 1928. ——— Ann. Appl. Biol. 15:529-539, illus.
- (74) 1929. Hall, Sir Alfred Daniel.
The book of the tulip. 224 p., illus. London.
- (75) 1929. McKay, Marion Bertice, Brierley, Philip, and Dykstra, Theodore Peter.
Tulip "breaking" is proved to be caused by mosaic infection. U. S. Dept. Agr. Yearbook 1928:596-597, illus.

Forms of Pine

BY ARTHUR D. SLAVIN

This discussion in the main devotes itself to those species and varieties of the pine which either singly or in combination may be used most advantageously for ornamental planting. The material is composed of trees and shrubs which are particularly hardy in the north-eastern states although they are, in most instances, adaptable to the greater part of the country. Some of them are old friends that we have long known; others, either new or old, have had little distribution in ornamental work. A check list including all of the material in the genus whether it be described at length or entirely omitted in the body of this paper serves to conclude the article. It may be considered as a brief gathering-up of the main points of the materials described and as an outline of the essential characteristics of those members which, either because of their commonness, or unimportance in ornamental work, would require too lengthy a discussion.

The pine tree expresses the highest ideals of the conifer. It is doubtful if any other member of the cone-bearing group is more in our minds whenever we hear the word *evergreen*. An investigation of how long a time the pine has been cultivated by man would be a complete study in itself. Let it suffice to say here that the generic name *Pinus*, as it is used today, is the name the Romans used for the pine tree.

This genus enjoys a really world-wide distribution, there being few if any major countries where one or more species are not to be found in the native state. The varieties come from many sources. Probably the

most interesting are those from Oriental lands where they have been cultivated for longer periods of time than we can estimate. Europe has furnished many of our gardens forms where they have long been grown by skilled hands. In America the contribution of horticultural forms is more recent, probably dating from that period during the middle of the nineteenth century after we became a more settled nation after the pioneer days.

The usefulness of the pine in ornamental work is almost unparalleled. Bolder and more enduring effects are to be obtained with the members of this genus than with any other group of the coniferae. The varieties when given the advantage of good growing conditions appear to out-live most of the other forms of cone-bearers while the species, once established, go on forever.

Necessary methods of propagation appear to be the only reason why the ornamental forms of the pine are not more commonly seen in our gardens. The species are easily raised from seed but grafting is the only successful means of propagation for the varieties if the work is to be accomplished on any scale. Unlike the *Arbor-vitae*, *Chamaecyparis*, and *Junipers*, they do not come well from cuttings and so are not available at low prices. This is the one reason why they are not more universally used. Propagation by grafting is accomplished under glass, the stock being potted up in late summer or early fall and placed on the propagating bench. About January the stock begins to grow and the work of grafting

begins. A veneer graft is used and after being applied is left to heal. In late spring the grafted plants are set out in shaded frames and the stock is cut back until only the scion or grafted part remains. Although a fair representation of this material is to be found in gardens at the present time, it is to be hoped that, as horticultural pursuits become more developed and the desire for plants acute, we will eventually see a greater use of the pine in ornamental planting.

The pine is really a forest tree, and as such does best when provided with soil conditions at least similar to wooded sections. A good loam should be provided and this should be as deep and as rich as possible. Like all conifers, the pine requires well drained soil. Those species which are native or very hardy require little or no protection and often form objects of picturesque beauty when so orientated that their branches are swept by prevailing winds. It is necessary in such locations, however, to protect young plants until they become established. Dwarf plants should have some sheltering because they are usually slow growing and are not able to recuperate quickly after a bad season. In general, dwarf specimens should not be placed where they receive continued shade, but rather where they may have plenty of light and air with some protection from the full heat of the sun in mid-day.

In our woody plants, most of the species may be outlined according to their habit of growth. Were it not for this factor we would have little use for a great vocabulary of names and could contain a maximum selection within comparatively confined limits. It is fortunate for our purpose that the pine is, without doubt, the most liberal in its diversification of habit and growth characteristics of

all the conifers possible of cultivation in this country. A broad outline of these factors would contain, primarily, the tree and shrub forms. The tree group would be further divided as follows: those of distinct or unusual habit, columnar forms, pendulous forms, and material whose ornamental value lies in some color character which it possesses. The same grouping would apply to the shrub group, or as it is more commonly termed, the dwarf forms. In this latter group, however, the differences in habit are not so pronounced, hence for the sake of simplicity, we shall not subdivide this group. As the subject is one of horticultural concern, it appears best to sacrifice taxonomic order and proceed with the ornamental aspect of the specimen first in mind.

TREES OF DISTINCT OR UNUSUAL HABIT

This is a subject which may easily contain omissions or perhaps unduly emphasize materials which, in the minds of some, are only usual in habit. By way of explanation it may be said that this material has been so chosen because it demonstrates some character sufficiently developed to be of value in ornamental work but not duplicated in any other form. As first stated, our outline was to be general and rather than to make many subdivisions it appears best to place here all those tree forms which cannot be classed ornamentally as having columnar, pendulous, or color habit.

We must go to the Himalayan Mountains for our first selection, *Pinus excelsa*. It is a member of the White pine group and is without doubt the most beautiful of the five needled pines. Provided it receives some protection, it is hardy as far north as Boston, and south of Long Island weather conditions affect it not at all.



Arthur D. Slavin

Pinus excelsa

Although long since introduced and represented by fine specimens in several of our older plantings, I would not care to venture an opinion on the dimensions of the largest possible specimens in this country. It is known that trees exist more than fifty feet

tall in several old gardens. The outstanding characteristics of this species are its leaves and branching habit. The foliage is a soft, grayish green which has that fine personality of color which causes it to blend in a soft but striking way with whatever may be its

surroundings. Like all the white pines, the leaves are arranged in fascicles, or groups of fives, and are the longest of any of the species. They average from five to almost nine inches in length and droop gracefully from the branches. The cones are interesting on older trees as they appear in some profusion and are very long and bulky. They measure about nine inches in length. The branching habit of this tree is its crowning glory and would retain it as a leader regardless of its other factors of beauty. The branches are long, spreading, and generally horizontal becoming somewhat drooping towards the ends as if supported only by the surface provided their mass and covering of foliage. It is to be expected that specimens in the wild attain greater height than breadth although in a general way one need not tax his imagination to make both dimensions appear almost equal in cultivated material. Its use is restricted to specimen planting and considerable area should be allowed for its development. Like most conifers it enjoys the companionship and protection of other materials while it is young. A common and most excellent practice is to surround it with other conifers which may be considered as fillers to be removed as the permanent planting develops.

More because of its similarity to the preceding species than its positive individuality, *Pinus Armandi*, the Armand Pine, comes next to mind. A native of central and western China, Formosa, and Korea, it is of more recent introduction, having been in this country only since 1895. Whether its scarcity in cultivation is due to its comparatively recent debut or because it is not considered hardy, is a question not easily answered. There have been reports that it is not as vigorous as *Pinus excelsa* but local observations

do not show such tendencies. It is fully as vigorous and adaptive to our climatic conditions as the Himalayan species provided it be given generous shelter while young. Specimens in the local pineta show a maximum growth of thirty feet in twenty-two years, and in the particular specimen from which these dimensions were taken, the maximum breadth is now twenty feet. Specimens at the Royal Botanic Gardens at Kew, England, are more than forty feet tall.

This species is not as wide spreading as its near relative, the Himalayan White Pine. The branches are loose and generally horizontal. A good specimen which has had room to develop most often appears as a broad, pyramidal tree with perpendicular sides and roundish head. The foliage is long, slender and drooping. The fact that the leaves are generally a few centimeters longer than *Pinus excelsa* is hardly a good determining factor, and hence, we take their bright green color as the principal means of differentiation. The cones are easily identified. They are cylindric and generally six to eight inches long with a diameter, before the scales expand, of two to three inches. Specimens at Rochester have been producing cones with fertile seeds for at least the past three years. To pass on without some discussion of the ornamental value of this tree would be in the manner of an omission. Specimens only fifteen feet tall produce cones which because of their size have a decided ornamental effect. Before maturity they hang gracefully in clusters of one to three and are dark green in color. As they are most often seen towards the top of the tree, one is reminded when peering up through the branches of cudgels hanging from long brackets which, if they were to fall, would strike the ground with vicious force.



Arthur D. Slavin

Pinus Armandi

This impression can hardly be considered over-emphasized as they weigh approximately one half pound each.

At maturity the scales spread and the seed is dispersed. This occurs in mid-September or early October. They

then dry up but do not lose their shape, and unless in the sweep of a good wind, remain on the tree for some time, their light brown color contrasting beautifully with the bright green foliage.

The next is *Pinus parviflora*, the Japanese White Pine. As the common name signifies it hails from Japan and also belongs to the White pine group. How long it has been propagated in its native country is probably unknown. The Japanese have been adept in the art of gardening for at least the same period of time as we of the western world. In cultivation, this tree is ordinarily of small size and seldom attains a height of more than thirty feet with fifteen to perhaps twenty-five feet as a more sensible average for trees of a fair age. Wilson states that in the wild he has observed at least one specimen more than ninety feet tall. He also classifies it as an inhabitant of the more mountainous regions.

Written accounts and illustrations indicate its habit of growth in the wild to be pyramidal with comparatively short, horizontal branches. In cultivation we know it otherwise. Reasons for this condition can best be explained by some comments regarding its cultivation.

In Japan it is widely used as a garden plant and is generally cultivated as a dwarf. This condition is brought about by the seemingly odd procedure of grafting it on native forms of hard pine, a process we have learned to always avoid. It is well known that in grafting the first requisite is to select stock as closely allied to the scion as possible. However, in this case an exception is made with the result that, due to an incompatibility of scion and stock, the plant does not make a vigorous growth and a dwarf specimen results. De-

velopment is slow and the plants take on a contorted, gnarled habit. In our present day expression, we call this condition *japanesy*. It is without doubt picturesque. European and American growers follow the practice of grafting on *Pinus strobus*, a species closely related and hardy, but in this case, too, the result is generally a smaller type of tree with a wide spreading habit which is truly picturesque. This latter condition is particularly noticeable in specimens whose branches are irregularly placed and which have the tendency to ascend acutely towards the ends. It may be said that most of the material in this country is grafted stock.

Several characters identify this tree and perhaps the most easily discernable is its habit of branching to which we have just referred. The foliage is bluish green and whitened on the ventral surface. It is usually made up of twisted group-like formations which are arranged in tufts at the ends of the branchlets. The leaves are quite fine and measure from one to slightly more than three inches in length.

The Single Leaved Nut Pine, *Pinus cembroides monophylla*, may be considered by some horticulturists as more of an oddity than a reliable plant material. I cannot accept this view because it is neither an oddity nor is it unreliable. That this botanical variety from Arizona, Colorado, and the drier regions of California contains valuable elements of beauty is not to be denied and its only concern in our minds need be of its hardness. This factor, I may say from my own observations, should not affect plants as far north as Boston and in the Middle Atlantic States their success may be assured. It should have protection while young, but once established, it demands only a filter from our sometimes bleak continental winds



Arthur D. Slavin

Pinus parviflora

and our brilliant sunlight in winter.

Its taxonomy is interesting as it belongs to the White Pine group most easily identified by its single sheafed leaf. This character is most easily explained. It is a single leaf form of *Pinus cembroides* which has four and generally five leaves to a sheaf. For this reason, cultivated specimens, unless collected in the wild, are propagated by grafting on the common White pine. It is sometimes said that the leaves occur in pairs but I have never seen material which demonstrated this character. The foliage is round in cross section, stiff, sharp pointed, bluish or glaucous green in color and one to two and a quarter inches long. It develops most often as a small tree of pyramidal habit and symmetric form. The branches are many and closely arranged in somewhat ascending fashion. A specimen in Rochester planted twenty-eight years ago is now eighteen feet tall. From this it may be seen that it is not a large tree but is sufficiently slow growing that it may be placed among other plantings for its own protection for some time. In the ornamental shrub garden it will always prove an attraction and remain as an interesting development for many years to come.

The Western Yellow or Bull pine, *Pinus ponderosa*, cannot be equaled where the requirements call for an evergreen of large size and bold character. This tree, a native of the Rocky Mountain range and western plains as they extend from Canada to Mexico, is well named and the specific designation *ponderosa* meaning ponderous is a fitting and descriptive title. In the wild it reaches a height of more than one hundred and fifty feet and is a valuable timber tree. Specimens when grown for ornamental purposes in the eastern

parts of this country are most hardy when they originate from stock found in the drier sections of its native haunts. It is entirely hardy and requires nothing more than a medium amount of protection while young or until it becomes established. For our northern plantings this species is the largest in its character of growth that climatic conditions permit. In the wild it is a narrow pyramidal tree but in cultivation, especially in the east, it forms a broad specimen with a huge round topped head. The branching is horizontal or somewhat drooping and of heavy countenance. The foliage is the crowning glory of this species appearing in great bulky masses on the branchlets. The leaves are dark green, and the largest of any species possible of cultivation within our region. They average six to ten and a half inches long. The cones provide an especially determinative character as they leave, after falling, several of the basal scales intact on the branches. Their other features are not outstanding. They are of regular outline, lustrous yellowish brown in color and are generally three to six inches in length.

It is most important that the species as described here not be confused with the form *Pinus ponderosa scopulorum* which is now common in the trade. The latter is smaller in every detail and lacks the enormous contrast found in the species. It is a habitant of the more dry regions from South Dakota to Texas and is very hardy in cultivation. In ornamental work its general appearance does not differ greatly from the Austrian and Red pines, so except to mention its vigor and hardness under what are sometimes adverse conditions, it is not sufficiently important to warrant a lengthy discussion of its characters.

The Western Yellow pine offers



Arthur D. Slavin

Pinus cembroides monophylla

considerable opportunities for use in ornamentation. Some care is necessary in its placement and since it has a graceful though bold aspect, it should not be used where daintiness is desired. The surroundings are most

*Arthur D. Slavin**Pinus ponderosa*

suitable when they present a heavy mood, near stone or brick buildings and other large trees. Sufficient room

for ultimate development of the specimen is also a prime necessity.

(To be continued.)

Herbs for Ornament

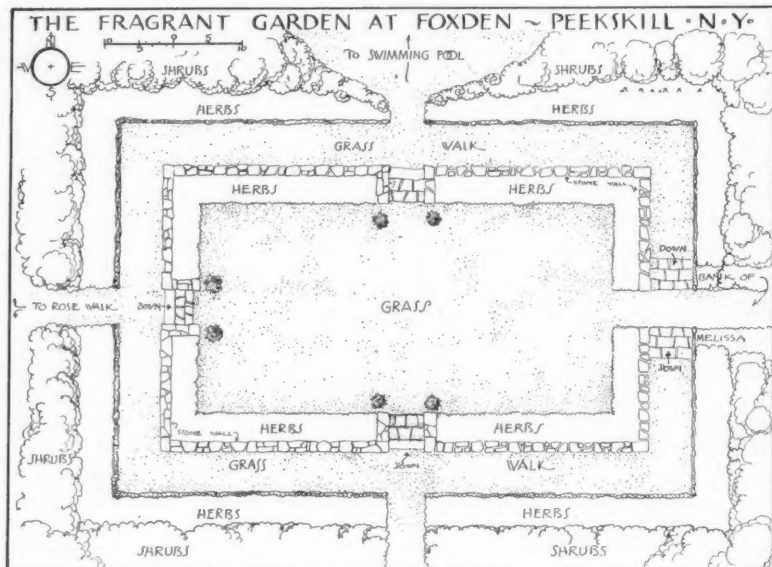
By HELEN M. FOX

When herbs are grown in this country instead of being an integral part of the design of the flower borders or vegetable garden they are tucked away in some remote corner. In France and England, where the vegetable garden is a place of exquisite neatness, the beds of red beets may be margined with red-leaved basil and feathery carrots outlined with the spear-like leaves of the chives, while purplish cabbages, as likely as not, are surrounded with plants of *Thymus vulgaris* with its greyish leaves. Quite frequently quaint gardens with walls of brick or stone and beds arranged in geometric patterns are filled entirely with fragrant herbs. Many of the herbs are decorative enough to grace the flower garden either amongst the perennials in the hardy border, or creeping over the stones in the rock garden, and in fact, have found their places amongst the "ornamentals" long ago.

With few exceptions, the herbs thrive in a sunny well-drained situation and in friable moderately rich soil. Too rich a soil causes them to run to leafiness, while too hard a soil bakes around their roots and dwarfs them. Where the herbs such as chives, basil and summer savory, are cut back frequently, it is a good plan to stir a little fertilizer into the ground around them from time to time.

I had been growing so many of the aromatic herbs and their relatives that I decided to make a fragrant garden of the handsome ones. For this I needed a flat space filled with loamy soil for certain of the plants and a rock garden for others. The design of the little Dutch Garden at Hamp-

den Court suited my needs perfectly. Although the American copy like the English original is rectangular and on two levels, the upper one supported by a low stone wall, no one would ever recognize the source of the inspiration. My garden faces south and was laid out on an axis of the swimming pool from which it is separated by a hedge of English hawthorn, not overly healthily looking as yet but in time I hope it will be like clouds of pale pink bloom in spring, a solid green wall in summer and a thicket of scarlet berries in the autumn. In front of this hedge is a planting of fragrant shrubs, such as magnolias, several rose species, and many bushes of *Rosa rubrifolia* for the contrast of their dark red foliage with the grey leaves of the herbs. Other shrubs are *Lonicera fragrantissima*, *Lonicera syringantha Wolfii*, hybrid lilacs, *Philadelphus virginialis* and *Viburnum Carlesii*. In front of these shrubs which form four beds around a hollow rectangle is a goodly space in which to grow tall herbs. Here are the monardas with violet, and rose-colored flowers. The new hybrid *Monarda salmonea*, a lovely shade of pink and the species *M. fistulosa alba*, a white one are especially attractive. The foliage of the monardas is fragrant of spice and keeps its scent a long time after it is cut. In amongst these are plants of the fragrant *Valeriana officinalis*, called Garden Heliotrope and in front of these the hyssops, an aromatic herb mentioned in the Bible. This is a handsome shrubby perennial with dark green leaves and spikes of either white, pink or blue flowers, the different



colors all blend well together. There are clumps of *Salvia sclarea* var. *Turkestanica* more effective than the type *Salvia sclarea*, for the Turkestan variety is taller and has far more color in its conspicuous flower spikes which are a pinky-blue and white. They have a strong sage fragrance and coarse, humpy, hairy leaves. The hairiness gives a glistening, silky effect to the whole plant. In with these are the new nepetas with their blue and violet flowers but more of these later; the tansies with curled and crinkled leaves; and the tall *Artemisia*s such as *A. absinthium* which has decidedly grey foliage. Towards the front of the border are clumps of *Dianthus caryophyllatus*, a species carnation with quite tall almost single, scarlet petals which are used for flavoring wines in Europe. Some of the chamomiles are quite decorative and are in this bor-

der, among them *Anthemis Kelwayi* and *Anthemis tinctoria*. *Anthemis nobilis*, the true chamomile, is such an excellent ground cover with its mats of fern-like foliage that I have it planted nearby amongst the shrubs. There is an old saying that it keeps the garden healthy. There are also a few plants of the white-flowered variety of *Salvia officinalis*, the leaves of which are more slender than the type but also have the appearance of a puckery, grey, changeable velvet.

In the spaces towards the front are species tulips, a few choice irises, camassias, calochortus, and brodiaeas which do not rightly belong here, except, that the situation is so admirably suited to their cultural requirements. Besides, they bring color and bloom early in the season before the herbs have grown their new branches and unfurled their leaves. As soon as these



Silvia Saunders

The fragrant garden at Foxden

plants have blossomed and while the leaves still show above the ground, as a danger signal, against my digging into their bulbs, I fill the space with fragrant-leaved geraniums, such as the rose, nutmeg, ivy-leaved, oak-leaved and others and in with these also plant lemon verbena, rosemary and sweet marjoram which are also not hardy. With the exception of sweet marjoram all of these make good sized bushes by mid-summer and fill the air with their delicious scent. In warmer climates the rosemary is a shrubby perennial but with me it winter-kills and is therefore treated as an annual. It comes readily from seed and cuttings of old plants carried over the winter in the greenhouse. No fragrant garden would be complete without its quota of lavender bushes and I have found

the Dwarf Munstead variety is the best in my garden for it is more floriferous than either *L. spica* or *L. vera* although in England and elsewhere these two make good-size bushes covered with fragrant lavender blossoms. This border on the upper terrace is edged with a ribbon of shiny green *Satureia montana*, called winter savory, and sprinkled all summer with snow-flake like little blossoms. I find that here and there the plants die mysteriously during the winter, right alongside of other plants which seem exactly like them and yet come through very well and I have not as yet been able to determine the reason for this. Since the plant grows quickly from both seeds and cuttings, a supply of this charming edging flavoring and ground cover plant can be kept on hand.

In front of this border is a grass walk extending to the stone wall which is two and a half feet high and supports the little terrace. The wall is a dry one, made of field stones gathered from nearby fields, is much battened and has the chinks filled with top soil. In this are planted many varieties of thymes, satureias, nepetas, carnations as well as *Borago laxiflora*, a perennial with light blue flowers and trailing stems. The annual borage has deeper blue flowers and upright stems and is a bit coarse for a choice garden but handsome enough for a wide border. I like its rough leaves and the way the wirey, hairy stems nod so that one has to look up at the plant on some wall or bank to see the faces of the flowers. There is a white variety flushed with pink and a pink one. A few of the grey-leaved mints are in the wall, but they have to be kept in check. Down at the foot of the wall are fragrant violets and a few plants of *Teucrium chamaedrys*, wall germander, a good looking plant with tiny, dark glossy leaves and purple flowers, once used medicinally. The primulas might be in this garden but it is hot for them and a bit too dry.

In the three-foot border at the foot of the little wall is a satisfactory planting of *Crocus sativus*, the fall blooming crocus, the stigmas of which furnish the saffron. *Dictamnus albus* in pink and white varieties are here, too. The leaves of this plant were used to make tea in colonial days and the flowers are strongly and pleasantly fragrant of lemon, almond and vanilla.

The population of the lower border, however, consists principally of many varieties of the grey-leaved *Artemisia*s, and dwarf lavender bushes. It is bordered with *Santolina chamaecyparissus*, which looks like branches of

velvety grey coral and is so intensely grey that it picks up the other greys throughout the garden and intensifies the silvery quality of the whole. Six clipped junipers one pair at each of the three steps catch the silver note, too.

At the corners of the steps, to soften the stiffness of the masonry, clematis vines, the pink, purple and white varieties have been planted, but as yet the billowy masses of flowers and foliage are entirely in my imagination.

On these steps, last year stood pots filled with varieties of fragrant leaved geraniums but as these same plants did much better in the upper border it is planned to have lavender flowered lantanas drop over the sides of the pots this year and perhaps a few cream-colored ones.

Where the path (on a level walk) leads out from the garden, is a fourth stairway, consisting of a pair of steps built without mortar and bound together with soil. In the interstices have been planted many varieties of creeping thymes, some with grey foliage. At blossoming time the steps look bejeweled with purple, magenta, and white blossoms. When these thymes are trodden upon they give forth a stimulating scent of thyme and sometimes a whiff of lemon. In winter the foliage turns into lovely colors especially *T. serpyllum lanuginosa*, the wooly gray foliage of which turns a deep purple.

At night the garden is most fragrant and its pungent perfume is so pervasive it can be smelled for a great distance. In the moonlight the gray rocks and the silvery-leaved plants stand out against the dark green of the lawns and shrubs which seem to sink into one great all-absorbing shadow.

During the last two very dry sum-

*Silvia Saunders**Stone steps with thymes*

mers, when the phloxes were limp and the delphiniums dwarfed and sick and the leaves of many shrubs hung down from lack of water, so that one's throat felt dry and one's heart sick to see a condition one could not ameliorate these herbs behaved as if the long-drawn-out drought were the best condition possible for them.

Many of the plants mentioned are not procurable from nurseries or seedsmen in this country at present. With the exception of a very few which I had a permit to import they were all raised from seed procured from abroad. I believe specimens of many of the plants I have raised are now growing in the Government Experiment Station at Bell, Maryland, and in the Brooklyn Botanical gardens.

Since I am not in the least a skillful gardener and was so successful in

raising hundreds of these plants from seed, it means that they are not difficult or fussy to germinate and that any gardener if he so desires could grow them too. I have a tiny greenhouse which is a help in raising seeds but presume that a hot bed would do as well. Greenhouses should not be as scarce nor as much an indication that the owner is possessed of wealth. They are not expensive and should be far more numerous. It has been said that in England if a man has a little money he buys a greenhouse, whereas in America he buys an automobile. The advantage of a cold frame or hothouse is that one can control the rainfall and prevent the seeds from washing away, and one can also hurry the season by three months and there is far less chance of labels becoming mixed.

My soil is neutral and of heavy clay so for the seedlings I make a mixture of sand, leaf mold, and humus (either of top soil or soil taken from the compost heap). The seeds are raised in shallow flats and are planted in February or March, and as soon as the weather permits they are transplanted out-of-doors into cold frames. If there is no other suitable place for raising the seeds they could be planted in the open ground as soon as the danger from frost is over in spring. However, many gardeners plant their perennials out in cold frames late in the fall.

Once the plants are mature they can be increased from cuttings. The best time for most of them seems to be September. The cuttings are set in sand either indoors in a greenhouse or out-of-doors in cold frames. When they are planted indoors they are transplanted into fertile soil as soon as their roots have formed. Out-of-doors they are left in the sand until early spring and then transplanted into good garden soil.

THE MINTS

On the whole the mints are weedy plants and only a few of those I know are decorative enough for the flower garden. Apple mint which is *Mentha rotundifolia* although it has sprawly recumbent stems is attractive because of the white flecks on its foliage, but belongs in the herb garden.

Mentha argentea, the seed of which came from Rumania, and *Mentha rotundifolia argentea*, from Correvon, have glaucous furry foliage. They would be effective as ground covers where a greyish effect is wanted, but are too spreading for a garden. *Mentha longifolia mollissima* is another gray-leaved mint.

I secured a mint from Correvon

which he called *Mentha gattefossei*, which I cannot find in the literature. It is a creeping plant, with flowers like fluffs of white cotton, in whorls, along the stem. It is fragrant of pennyroyal and has smooth longish leaves and is an excellent ground-cover plant.

Mentha crispa with crisped leaved is fragrant of resin and a bit of turpentine and is vigorous and attractive because of its crisped and curled leaves. When grown from seed there was much variation in the character of the plants. This, too, would make a fragrant ground-cover.

Mentha requienii is the only one of the mints I have grown which fits into the rock garden. It likes a little shade and forms flat mats of shiny heart shaped leaves. These are tiny and measure one-eighth of an inch in length and are so tightly packed and flat that they look like a smooth moss. It smells of catnip more than of mint, to me, however, the author of Thompson and Morgan's catalogue says it is "literally reeking of peppermint."

ARTEMISIAS

The artemisias will in time no doubt be popular in American gardens for they seem to thrive in a dry situation and where there is little rain. The list of good looking artemisias is long and I have grown only a few. They are all hardy, perennial and most of them seem to come readily from cuttings.

The juice of *Artemisia absinthium* is an ingredient in the grey-green liqueur *absinthe*. The plant is about four feet tall and the stems and leaves are covered with a grey bloom and have a soft velvety feel. The flowers are inconspicuous but the branches with their much cut leaves are attractive in with other perennials. When crushed, the leaves smell faintly of

tansy. We cut our plants down to the ground once during the summer for they spread considerably and would interfere with the other plants if left alone. They come up again long before frost.

Artemisia abrotanum is called Old Man. It grows about two feet high in my garden but elsewhere to five feet. The stems are round, glaucous, and a little furry. The leaves are pinnately divided into fine thread-like segments. The whole plant is a grayish-green and feathery looking. It smells, when crushed of daisy mixed with spice.

*Artemisia albul*a, called Artemisia Silver King, is the handsomest of them all. It is a native American plant from the South West and is entirely a silver-grey. The whole plant is glaucous and most elegant with its linear slender pointed leaves and is quite hardy in northern gardens. When cut, in the fall, the silvery branches keep their leaves all winter.

Artemisia dracunculus, known as tarragon is not particularly attractive looking but an important flavoring herb and is grown in the vegetable garden. It likes a little shade and has to be increased from cuttings or divisions of the roots.

Artemisia frigida, called fringed wormwood, is native to Western North America, and is also silvery and pubescent and has the leaves pinnately divided into linear segments. The flowers are in a nodding head and yellow.

Artemisia lactiflora is a tall handsome plant six feet high with spreading much branched panicles of creamy flowers and much cut leaves. The flowers come in late summer and are conspicuous and attractive and excellent as cut flowers with gladioli and dahlias. I grow mine in the shrubbery

because it is such a vigorous spreading plant.

Artemisia pontica, Roman wormwood, never grows higher than 12-15 inches in my garden, but elsewhere is said to rise to four feet. It, too, has gray leaves so cut and divided that they look quite lace-like. It smells of a daisy. It spreads rapidly from stolons.

Artemisia stellariana, called Old Woman and Dusty Miller, has gray leaves shaped like those of the oak and of a soft, floppy, wooly texture. The plant forms flat mats over the ground for two feet or more, the leaf stems are recumbent but the flowering stems rise to about two feet. The flowers hang down like gray tassels, with many yellow fringes. Its leaves give an extraordinarily handsome and effective gray note. The plants is not scented.

Artemisia serrata is another gray leaved plant, said to rise to ten feet. The leaves are serrate, and quite whitish beneath, this according to Bailey is native in Illinois and South Dakota.

Artemisia vulgaris is too coarse for the flower garden, but has played an important role in medicine and folklore.

TANSIES

The *Tanacetum vulgare* is a weedy plant with button-like yellow flowers. It is handsome along roadsides and on the margins of meadows. Its variety, the *Tanacetum vulgare* var. *crispum* is a handsome plant. The leaves hang down and are a dark green, much compounded and with margins much crisped and feathered. The seed of it came to me from the Stockholm Botanic Garden. *Tanacetum herderi* is a dwarf with gray fern-like leaves which I bought in England. It has not flowered but I have increased it

from cuttings and find it a pleasant addition to the gray plants in the garden.

Tanacetum boreale has drooping leaves which are broader than most of the tansies and not crinkled, the leaf looks like a fern leaf.

Tanacetum hurohensis has smaller, shorter, narrower and more delicate leaves than *T. pseudoachillea*. Both of them are a darker green than *T. vulgaris* and with more finely cut leaves.

NEPETAS

The nepetas can be raised from seeds, mine came from the Royal Botanic Gardens at Edinburgh, Thompson and Morgan, Vilmorin Andrieux et Cie and Correvon. All these described are hardy and perennial and many of them are far handsomer than the ubiquitous *N. cataria* and *N. mussini*, some of them have blue and others violet flowers. *Nepeta cataria* is a husky plant and has the true catmint odor, which to my nose seems to have an undertone of garlic and camphor. It is a bit coarse for the flower border and has quite negligible flowers and I cannot understand why the nurserymen carry it and gardeners buy it.

Nepeta distans is a wooly coarse plant which is pleasantly fragrant, however, without being touched. It is taller than *N. granatensis* and the flowers blooming in August are arranged in loose spikes in the leaf axils. They are a pretty shade of blueish lavender, small and gaping. The stem is square, grooved, furry, about eighteen inches long and erect. The leaves are scalloped, furry, have a corrugated surface and are a yellow-green. The flowers are three quarters of an inch long and at the end of the lower lip a formation as if an extra piece were tacked on to attract the insects which

is grey marked with lavender and striped blue.

Nepeta macrantha is also a handsome plant, with recumbent, square, ridged stems. The leaves are rough, crisp and uneven of surface with round toothed margins and are not hairy to the naked eye. The flowering stems are 12-18 inches long and bear pentstemon-like flowers one and a quarter inches long in elongated panicles of the color of some violet irises and with the same iridescent quality.

They have a dark purple spot on the lower lip. The flower is a long tube separating into 2 lips, the central portion of the lower one being bearded. The stigmas are divided into two at the tip, the stamens are four and the anthers and filaments violet. The whole plant is fragrant of camphor, spice and a little of catmint.

Nepeta mussini is the best known and most popular of the nepetas. It has the virtue of flowering all summer and of being easy to propagate from cuttings and to raise from seeds and of being exceedingly amiable in its behaviour, but it has an unpleasant sour cat-like smell. The purplish brown, downy stems are recumbent, the small leaves are greyish-green with pointed scallops. The flowers born in feathery blue panicles hang down gracefully over rocks and blend well in their violet-blue tones with the rosiness of carnations or the purples of the campanulas. However, it is such a rank grower that it has to be cut back severely ever so often. It makes a fine ground cover where a cover 12-15 inches high and not a flat carpet is desirable.

Nepeta racemosa has hairy, wooly, recumbent stems. The margins of the leaves are frilled and scalloped and have a grayish bloom on them. When young they smell sweetly of camphor



Silvia Saunders

Nepeta dictans

and thyme but as the plant ages it develops a sour animal-like smell. The flowers are like tiny fluttery, butterflies of a pinkish-lavender shade with gray calyces and very gaping. They are three-quarters of an inch long and very slender, and in opposite clusters. The flowering stems rise to 18 inches.

Nepeta Souvenir d'André Chaudron—is very like *N. macrantha* except that the flower spikes are shorter. It has longish deep blue flowers somewhat like penstemons without their thick texture.

Nepeta ucranica is like *N. racemosa* except that in *ucranica* the leaves are smaller and the margins not as ruffled, nor is their surface as humpy. The flowers are smaller and blue instead of violet. The leaves are pretty with their downy, velvety surfaces and the plant is pleasantly fragrant. The flower stalks are about two feet high.

Nepeta violacea is 15 inches high and a weedy plant with square stems, tiny inconspicuous flowers of grayish white marked with lilac, minty looking green leaves, 2 inches long, diminishing to three-quarters of an inch above, the plant is without hairs.

THYMES

The Index Londonensis lists some 136 thymes, but I presume it would take a microscope or failing that, a keen eye and nose and perhaps a little imagination to see the differences in all of these. The thymes are all perennial and most of them creeping plants, which do well in dry, rocky situations.

Thymus vulgaris, common thyme is the one most generally used for flavoring. It is a subshrub not over 6-8 inches high and has many pinkish blossoms in loose conical spikes. The English variety of this thyme is a little larger than the French, which is more

fragrant to the taste and not as sharp.

Thymus azoricus is said to have rosy-purple flowers. It is a tiny plant and forms little cushionlike humps, high in the centre. It has a faint camphoraceous scent when crushed and also a bit of peppermint. The leaves are one-eighth inch long, and very slender and the stems are wooly.

Thymus erectus the seed of which came to me from Thompson and Morgan is fragrant of camphor and thyme. It forms little upright plants like the tiniest of Irish yews. The leaves are one-eighth inch or smaller, of a blue-green, the stems are brownish, wooly and round. Tragically enough I seem to have lost it in the moving from the greenhouse to the garden and did not see it flower.

Thymus herba-baronae is called the caraway-scented thyme. De Candolle Prod. xii, p. 200, describes it as follows:

Creeping, glabrous, the flowering branches short and ascending; leaves with short petioles, ovate-lanceolate, acute, rounded at the base, somewhat ciliate, the floral leaves similar; the teeth of the upper lip of the calyx short lanceolate, those of the lower lip subulate and ciliate.

Scarcely if at all distinct from *T. serpyllum* in shape of the leaves and the more lax habit.

Thymus nitidus Guss. Description from DeCandolle Prodromus xii, p. 200:

Stem rather erect with pubescent branches, leaves obtuse, very smooth, attenuate into the short petiole, shining above, lightly veined below and glandulose-punctate; the lowest ovate, the others ovate-oblong, flowers in dense verticillate spikes, calyx greenish at base, spike purplish and hirsute. Mts. of Sicily.

Thymus serpyllum called Mother of

Thyme is a creeping plant with many varieties listed under it. All of the *serpyllums* increased by roots which grow out from the creeping stems.

Thymus serpyllum coccineus according to Thompson and Morgan's catalogue is said to have bright red flowers. It has creeping stems which spread rapidly over the rocks and brilliant purple-magenta flowers with deeper magenta-purple markings, born in roundish heads. The plant grows three-quarters of an inch high, the stems are amber and the leaves are tiny and have stiff hairs. It flowers in June and July and again in August.

Thymus serpyllum splendens has red flowers and *T. serpyllum roseus* rose colored flowers according to Bailey. I have a plant I thought was *Thymus serpyllum splendens* which has rosy-lavender spikes of flowers. The stems are square and hirsute, yellowish green and the flowers are in bunches and whorled along the stems which terminate with a bunch of tiny green leaves. The leaves are less than one-half inch long, shiny above and dull below. They smell of spice and taste of camphor and thyme. This plant is very floriferous.

Still other varieties of *T. serpyllum* are var. *carneus* said to be flesh-colored and very fragrant but as yet I have not seen a flesh-colored one.

T. serpyllum var. *citriodorus*, the plants of which I bought hang down from the rocks in streamers, or like little green waterfalls. It is not very fragrant in my garden and has purple florets, only a few of which open at a time. They are one-quarter inch across, a true lavender with reddish purple markings on the lower lip, lavender anthers and purple filaments. The leaves are tiny, glossy and bristle with wirey hairs.

T. serpyllum var. *aureus* has leaves

the color of old gold. The flowers are pale lavender and inconspicuous, in the axils of the leaves along the stems. The stems have a tiny fluff on them and smell lemony and spicy. They flower late in June.

T. citriodorus aureus was the label on other plants bought from a nursery which have narrow pointed leaves and smell of lemon and aromatic. They have pinkish stems and the plants are wooly.

There is a silver-leaved *Thymus serpyllum* called *Thymus argenteus*. I bought my plants from the Poughkeepsie Nursery. The leaves are variegated with white and the plants are quite hardy and increase readily from cuttings.

T. serpyllum minus has very fine foliage. Mine came from England and have very fine foliage but have not flowered as yet.

T. serpyllum albus or *T. serpyllum* L. var. *albus* Hort. is a low creeping plant, with white florets in spreading panicles. The leaves are one-quarter inch long with stiff hairs. The stems are bright green and rootlets grow from their spreading branches. It smells sweet and spicy and when the leaf is chewed it tastes delicately of thyme and a bit of anise. One can buy these plants in the United States and can also procure seeds from Thompson and Morgan.

T. lanuginosus is also one of the *serpyllums* and has tiny wooly grey leaves and pale lavender flowers. The foliage turns a deep purple after frost and the plants spread widely when planted amongst the rocks.

SATUREIAS

The seeds of the satureias came from Correvon, the Royal Botanic Gardens, Edinburgh, and Kew. They come readily from seed and with their



Thymus serpyllum albus

glossy, aromatic foliage and generally attractive labiate flowers are a most attractive family. All but *Satureia hortensis* of those I grew were low, spreading shrubby perennials. I grew many more than I describe here because I am not sure enough of their identity to include them. *Satureia alpina* has purple flowers. I bought it as *Calamintha alpina*. It is a beautiful rock plant with much branched stems, woody at the base. It is about six inches high and the leaves are ovate, one-half inch long, slightly

toothed. It flowers late and in color reminds one of the deepest toned aubrietias.

Satureia croatica is a low spreading attractive plant about three inches high and twelve across. The stems root as they creep along. It is covered with pale lavender labiate flowers one-quarter to one-half inch long, which come in late May and early June. The leaves are yellow-green, toothed and shiny. The stems are angular, woody, brownish and the calyces are furry as are the upper-

most eaves. The leaves are kidney shaped, slightly toothed, one-half inch long, with the flowers in whorls of about five subtended by a pair of leaves. The lower lip is divided into three and the upper into two divisions. The calyx is brownish green with sharply pointed tips. The plant is not fragrant and has a bitter taste.

Satureia cuneifolia, according to Bentham, *Litiatarum Gen. et Sp.*, p. 353, 729, this *satureia* had better be referred to *S. virgata*. It is said to be similar to *S. montana*. Mine has not flowered but has leaves of a cuneiform shape. It is decorative with its shiny dark leaves and elegant form either for the rockery or as a ground cover.

The *S. montana* with *S. hortensis* are the two most used as flavoring herbs. *S. montana* forms mats of evergreen foliage and during the last two mild winters we picked bits of it for flavoring all winter long. *S. hortensis* is a pretty branching annual with pale pinkish-lavender flowers scattered over the plant. It grows 12-18 inches high.

S. nepeta flowers in July and is a weedy recumbent plant, smelling strongly of peppermint. The flower-

ing stems rise to 6 inches, the leaves are dark shiny green, hairy, pointed and toothed a little. The stems are square, and furry. The flowers are white, marked with pale lavender, in terminal clusters and along the stem. According to Bailey it is naturalized in America and also called *Clinopodium nepeta*.

Then I had *Satureia repanda*, which has not flowered as yet but looks like *S. montana* only that it spreads about two feet and is mounded over the ground. The leaves are fine and thin and spread out from the stems to form a sort of star pattern. They are one-half inch long and one-sixteenth inch across. The stems are spreading, woody and brownish and root as they grow. It has a peppermint smell and something unpleasant as of citronella without the lemon.

Satureia stenophylla did not flower in its second summer. It is 6 inches high and the same across and has spreading, attractive foliage. It is a leafy much branched plant, fragrant of thyme without crushing. The leaves are tiny, slender, hairy, shiny, dark, green, one-half inch or less long with strongly marked midrib on either side of which the leaf folds up.



U.S.D.A.

Fruiting Tree of Feijoa

The Feijoa

BY KNOWLES A. RYERSON

Among the many ornamental plants for whose introduction we are indebted to the late Dr. F. Franceschi (Fenzi) of Santa Barbara, California, the feijoa is one of the most striking. It offers showy blooms in late spring, richly flavored fruit in the fall, while throughout the year it adds its deep, glossy, evergreen foliage, silvered beneath, as its contribution to brighter and soften the garden picture.

The feijoa (pronounced fay-zho-a) is a fairly newcomer to cultivation. It arrived in Europe before it appeared in the United States, having been taken to France from its native home in the La Plata region of Uruguay in 1890 by the noted French horticulturist, Edouard André, when he returned from a trip to South America. This layered plant bore fruit in 1897 and, because of the highly ornamental character of the plant and blossoms and the aroma and flavor of the fruit, it won immediate attention among European horticulturists, resulting in widespread planting throughout the Riviera and other portions of the Mediterranean. News of the fruit reached the ears of Dr. F. Franceschi (Fenzi) and, in 1901, he introduced plants from the parent André tree. These he distributed throughout southern California. Independent introductions of seed from South America were also made. A few years later the Office of Foreign Seed and Plant Introduction of the U. S. Department of Agriculture undertook its distribution into southern states as well as in our tropical possession. As a result of these early plantings, its adaptability

has been pretty well determined and a number of improved forms have been developed.

The feijoa, botanically known as *Feijoa sellowiana*, Berg, is a member of the myrtle family and a close relative of the guavas; in fact, it is often referred to as a guava. In its native home in Uruguay, Paraguay and adjacent parts of Brazil and Argentina it is called *guayabo de país*. In form it is a bush or shrub, upright and vigorous in habit, reaching a height of more than 15 feet. Its thick, abundant, evergreen foliage is dark, glossy green above and silvery gray beneath, and somewhat resembles the elaeagnus. In addition to the more common and desirable upright form, there are several other distinct types: a much less desirable one, open, sprawling and low, and another almost dwarf, compact and with small leaves being fairly common.

While its foliage alone should warrant its use as a garden ornamental, its brilliant and showy blossoms make it doubly attractive. The individual flowers are from one to two inches in diameter; the four thick, fleshy petals, reddish purple on the upper surface, snowy white beneath, are recurved or cupped to give a marked contrast between the two differing colorations. A stiff tuft of brilliant crimson stamens stands upright in the center of the blossom topped with rather prominent anthers which, on opening, expose their bright golden pollen in abundance. The blossoms appear in profusion about the first of June continuing for several weeks. The petals are

edible and are used in salads in South American countries. Certain birds also feed upon them and it is reported that cross pollination is effected by them in its native habitat.

Fruit bearing usually begins the third or fourth year, the crop maturing from September to December. The fruit is predominantly round to long oval in shape and ranges from one to three inches in length. It is unfortunate in its color, being a dull, dark green usually overlaid with a light gray bloom; some forms are lighter green in color and some have dark maroon cheeks, but these are not sufficiently striking to permit real competition on the average fruit stand. Some are very smooth on the surface, others quite rough. The soft, delicate pulp in which the small seeds are imbedded is enclosed in a layer of more granular flesh from one-eighth to one-fourth inch in thickness. The description of the flavor varies with the stolidity of the taster, at one time or another it has had ascribed to it the flavors of a number of our more popular fruits, but it doesn't seriously challenge any of them. It does have a rather distinct pineapple flavor, hence one of its common names—pineapple guava. It is very rich and aromatic—too much so for some people. Its aroma perfumes a room in which a few fruits may be placed. It can be eaten out of hand, or peeled and served with cream and sugar as is done in France, but it finds its greatest use in the making of jellies and jams, excelling the fig in the opinion of many.

While its requirements are subtropical in character—it belongs to the same region as *Cocos australis*—it enjoys a much wider range of conditions than most of the fruits in this

group. On the Pacific coast it grows as far north as southern Oregon, it has withstood temperatures as low as 11 degrees F. at the Government Plant Introduction Garden at Chico, Calif., but it does not enjoy high summer temperatures such as are experienced in desert sections. In so far as fruiting is concerned, it prefers the more arid conditions of the west to the more humid conditions of the southeast. It grows and fruits in Alabama, while in Florida it has been grown down into the southern portion but fails to fruit satisfactorily. It is obviously subtropical rather than tropical. As the early introductions arrived at blooming age, many plants were observed to flower profusely but season after season failed to set fruit. Experiments conducted by the author in California and by Wilson Popenoe in Florida demonstrated that many plants were self sterile but set fruit readily if cross pollinated.

As a garden shrub, the feijoa is far from exacting; it thrives cheerfully in heavy adobe soil and does well on light sandy types, though some experience in France indicates it doesn't enjoy an excess of lime. Like other shrubs it responds to liberal supplies of organic matter. On the Pacific coast, where there are no summer rains, frequent irrigation is required, if vigorous growth and heavy fruiting are secured. Unless one has unfortunately planted the more sprawling, open type, very little pruning is required to keep the shrub in proper shape. Grown as a hedge, it is fairly satisfactory but does not form a very dense wall of greenery. In southern France, particularly in the cooler parts of the Riviera, it is grown against walls to provide additional warmth. This has been practiced to some extent



U.S.D.A.

Flowers of Feijoa Sellowiana
About two-thirds natural size

in a few spots in southern England, though it has failed to fruit outdoors in the latter country.

Few insect pests seem to like the feijoa; black scale (*Saissetia oleae*) is the only one found at all commonly in California. No diseases have so far appeared.

The feijoa is propagated readily by seed, but if one wants to be sure of having satisfactory fruiting plants he should graft his seedlings or else secure grafted or layered plants to begin with. The seeds are small, about the size of those of the fig, and when planted one-quarter inch deep in shallow seed pans or flats start readily in about three to four weeks without bottom heat, and in about half that time with it. Half sand and half soil or half sand and half leaf mould make a good propagating medium. Care must be taken to avoid damping off. They should be pricked off and potted when the second leaves appear and are ready for setting out when four to six inches high. For grafting, two-year-old seedlings are used, the operation being performed during February and March. Well matured wood of the previous season's growth is used for scions, either whip or cleft grafting may be used, the scions being inserted just above the surface of the ground. Budding has not proved successful, as the bark is too thin. Cuttings can be rooted under glass, basal cuttings from around the crown, taken with a little heel, being more satisfactory than tips. Layering is also very successful with the feijoa, though slow. The branches closest to the

ground are bent down and covered with soil for a distance of three to six inches; they usually will root in about six months. Grafting, however, is the general practice used by commercial nurserymen.

Several superior named varieties have been developed in southern California and are now available from nurserymen as grafted plants. These are the Choiceana, the Superba, and the Coolidge. The first was one of the earliest improvements; it is large in size, frequently measuring three inches in length and two or more inches in thickness; it ripens in November. The Coolidge is somewhat smoother and matures a little later than the Choiceana, while the Superba differs from the others mainly in shape, being broad oval to broad pear shaped.

In the earlier years of its culture there were hopes on the part of many growers that this fruit would find a ready place in the fruit trade, and a number of commercial plantings were made, but these haven't been outstandingly successful. A new and unknown fruit has to meet the very keen competition with all the other fruits already established. It has no outstanding characteristic that immediately commends it. Its color is not attractive; its flavor too rich for many, a little goes a long way. Outside of a limited local market, it will probably always remain primarily an ornamental which, in addition to being attractive in appearance, yields a perfumed fruit that will find welcome on many a family table.



Lilian A. Guernsey

Fruits of Feijoa Sellowiana
About two-thirds natural size

A Record Planting of Box

BY LILY LOGAN MORRILL

Out of a total of sixty-six box bushes planted last spring, I can now count sixty-five which are healthy and sprouting, with only one looking puny and jaundiced. Of course, there is a complementary affinity between red clay and green box—but not always, as I know to my sorrow. Over two years ago I lost half my bushes planted in the same soil and I know a nearby clubhouse where the box was switched over only from the backyard to the front, and a year after moving they are mostly straw-colored. I am inclined to think that sixty-five out of sixty-six is a good average, even for Virginia.

And because my record is good, following another planting where half the shrubs were lost and the remainder look as if they had been one-sidedly chewed by cows, I should like to point out the differences in treatment each time.

First of all the unsuccessful bushes were put out in the autumn so, in order to help them resist the cold, we surrounded the exposed sides with pine boughs. Now, box being exclusive, doesn't mind cold as much as contact, and wherever the boughs touched the newly planted bushes, the latter began gradually to wither. Autumn contact covering was our biggest mistake, but we also bought plants too large for their roots, later furnishing insufficient nourishment and fertilizing too near the center of the bushes.

The successful plants were placed in fairly rich soil during May, so we

gave them no extra food for fear of summer scorching, using only about a half-inch of dry leaf mulching. The tops were already full of new verdure, for box makes most of its growth during May, June and July. These fortunate bushes had a spread no larger than their earth-balled roots. The roots we disturbed as little as possible, preparing for them deep-water-filled holes, but actually planting them even with the surface—that being the way box likes to grow.

We remembered this shallow habit of box roots when October brought around the time for fertilization. A friend of mine killed her box trees, by bruising and breaking tender roots, in deep fertilization. On each medium-sized bush, with a spread of about five feet from the ends of the branches on one side to the tips on the other, we then used about two pounds of *raw* bone meal and a pound or more of sheep manure. A large box with twice the diameter would require four times as much food. On a tiny border box a quarter pound of the 2-1 mixture would suffice. This fertilizer we did not place near the trunk, but in a circle where hungry root tips were reaching out in their search for food and water. The mixture was worked well into the soil, but of course not deeply, because of the shallow habit of the roots. This feeding was supplemented in late November, when we mulched the bushes with well-rotted cow manure, covering all with leaves. The winter after fertilizing and mulching did



The larger bush is properly lifted; the smaller bush shows improper removal of earth from roots, which are numerous, small and close to surface.

wonders, especially to those bushes in the most exposed positions, for box loves semi-shade.

Just now, the *sempervirens* are growing by leaps and bounds, the *suffruticosa* following after, more staidly and evenly, but very vigorously. A Virginian told me the other day that "slow-growing" box did not need to be slow growing at all if properly nourished. On the old places it was left to find its own nourishment, so had to take its time about growing.

Here are directions I would give to those planting box:

Buy healthy-looking plants with dirt-covered roots large enough for the tops.

From old home to new one make the interval as short as possible, using plenty of water, and not planting too deeply for box trees like to feed near the surface. Give the feeding where it can be used at the roots *ends* followed by mulching with leaves and well-rotted cow manure, and do this in late autumn.

During summer, soak thoroughly at least twice a week, wetting the tops also. I do not agree with a friend of mine who uses a pipe system direct to roots. Rain doesn't act that way! Those luscious green tops crave their share of moisture, and overhead spraying also helps to wash away insect enemies.

Boxwood pests are not common in this part of Virginia, but may arrive any day, so yellow, unhealthy-looking foliage should be regarded with suspicion. The oyster shell scale, which looks like its name, can be seen with the naked eye along diseased branches. Around June fifteenth, the bluish eggs under the scale turn into tiny white juice suckers. Before they've robbed the plant of all its new, tender growth, get to work on them

with a force pump and any good contact poison.

Or perhaps an even more deadly enemy has chosen earliest spring for a homecoming with roof, walls and floors complete inside your box leaves. This maggot miner (*Monarthropalpus buxi*) is too snugly placed to be poisoned or dislodged without serious injury to his host and home. Wait until around May first, when the tiny creatures emerges as a bright orange fly, about mosquito size. When she is about to spread her pretty white wings and breed another crop of babies to grow up in a new subdivision of your box-leaves, you can spoil her plans by following the directions of Susan F. Park in *Garden Gossip*, April, 1930: "The leaves are sprayed with molasses diluted one-third with water and seasoned with one pint nicotine sulphate to each fifty gallons of water. Should rain wash the mixture away it should be renewed promptly, for it is important to keep the leaves covered for the period of ten days or two weeks in which adults are emerging." This sticky covering acts like fly paper, entrapping and poisoning the insects.

Contact spray should be used in fighting box-wood psyllid, a jumping plant lice, easily recognized because it exudes a ribbon-like string of wax.

For "red spider," spray with nicotine sulphate or soap solution or dust with flowers of sulphur. (Mrs. William J. Phillips in same number of *Garden Gossip* as above.)

When your box leaves, or even branches, are dead and sere from insect ravages or other causes, they should be removed to keep the diseased condition from spreading. I have noticed almost immediate improvement in most of my plants after cutting out completely dried portions.



Improper planting of box, with soil mounded about plant and raised above ground level.

This was especially the case where large parts had died from too much winter covering.

So far as shelter from cold is concerned, this is hardly necessary in central Virginia and further south. In the north where covering is needed, the protector should be kept from touching the protected. This can be

done by placing stakes at a safe distance and then surrounding with canvas, as in the illustration.

Still less protection is needed if the trees are acclimated before winter—that is, by spring planting. But the counter problem then arises of the long hot summer ahead. To prevent a direct beating down of sun rays on

the tops of newly planted box bushes, these should be roofed over—without contact or side protection — using light canvas or wooden slats to break the force of the glare. In summer watering is also necessary; a great deal at the time of planting and as much as possible during droughts. Davey, the tree surgeon, sums up in his little pamphlet these ideal conditions for box: "Constant moisture (not wetness), moderate loam, partial shade, some shelter from heavy winds."

Before making your purchase of box be sure you know what kind you desire. If you wish neat compactness and antiquity regardless of price, choose *Buxus sempervirens suffruticosa*. For quick results at a smaller price, *Buxus sempervirens*, but never let yourself be cheated into buying

the rapid grower at the larger price. The various illustrations show the difference in growth and shape of leaves, which are smaller and less pointed in *suffruticosa*.

There are many other attractive varieties of *Buxus sempervirens*, as *aurea*, the golden kind, so prized in England, and *argentea* with leaves edged in silvery white. *Rotundifolia* is often found in old Virginia gardens.

A distinct species is *Buxus japonica*, hardy and rapid growing with "spreading, slender branches and light green, lustrous foliage." (Bailey.)

But all box bushes, whatever the species or variety, are hungry and thirsty to the point of greediness. Abundant moisture is necessary to sustain that weight of heavy, evergreen foliage which is, of course, their greatest charm.

The Crath Carpathian Walnut

By J. A. NEILSON

Horticulture Department, Michigan State College, East Lansing, Michigan

Nut Culturists in the North will be interested to learn that two English Walnut trees have been discovered in Canada which appear to be hardier than the average of the species as grown in the Northern United States. One of these trees was introduced by the Reverend P. C. Crath of 48 Peterboro Avenue, Toronto, and is a seedling of a hardy type from the high northern slopes of the Carpathian Mountains in Southern Poland. In that part of Europe the winter temperatures are said to go to 20° below zero and, therefore, we might expect that trees from this region would be hardier than the cultivated varieties in America which originated in the mild climates of countries of Western Europe.

The Crath tree is nine years old from seed and has not been injured by the coldest weather prevailing in Toronto since 1924. The tree is a vigorous grower with strong, sturdy branches, large leaves and plump buds. The terminal buds are formed early in September, thus permitting the tree to enter the winter in a well ripened condition.

Blossoms were produced in 1931, and many nutlets were formed but none matured. In 1932 the tree blossomed again and produced a few fully ripened nuts. The nuts are broadly oblate and are about the size of a No. 2 Diamond brand Walnut. The shell is well sealed and of moderate thickness. The kernel is plump with a flavor, which compares favorable with other good strains.

The other tree was discovered by

Mr. J. U. Gellatly of Westbank, B. C., who found it near Broadview. This variety has been named Broadview by Mr. Gellatly, and is now being propagated by him.

The Broadview came from a part of Russia where the winter temperatures go to 25° below zero, and in British Columbia it has shown unusual hardiness having endured 30° below zero. The nuts are above the average in size, somewhat pointed, and are well filled. The tree bears regularly and yields a good crop.

The hardiness and other good characteristics of the Crath and Broadview varieties would suggest that these varieties should be propagated for further trial in the north. It also suggests the desirability of a thorough search of the colder parts of Central Europe for the purpose of locating walnut varieties of superior quality, and of greater hardiness than our well known commercial sorts.

The Bureau of Plant Industry has done work of inestimable value by introducing good plants from abroad, but insofar as the writer knows, comparatively little attention has been paid to nut trees from Central Europe. Just now when there is retrenchment on every hand in the expenditure of public money, there is not much hope for action from Government Bureaus; and, consequently we will have to look to other sources for assistance. In any case, this region offers possibilities and it should not be overlooked in our search for hardy varieties of English or Persian Walnuts.

Six Years in Growing Black Walnut Trees

BY L. K. HOSTETTER
Lancaster, Pa.

In the spring of 1927, I planted about a bushel of locally grown black walnuts in nursery rows. The seed proved good, the soil was rich, and the rainfall abundant. Therefore, the young trees grew rapidly and one year later I dug up and transplanted enough to make a 15-acre orchard. Two-thirds of the tract was set with the trees 60 feet each way, or at the rate of 12 to the acre, making a total of 120 trees. The other third was set 30 feet each way or 48 per acre, making 240 trees in this part of the orchard, and a total of 360 trees on the 15 acres. A year later or in 1929, 2 years after the seed had been planted, I made a duplicate planting of 15 acres, using the same distance and of course, the same number of trees, thus bringing the total then up to 720 trees.

The trees in the 10-acre tract put out during the second year were grafted some six weeks later with about 60 per cent successful unions. In 1930, all trees in the first planting, or two years after being reset, were grafted with about 70 per cent success.

In 1931, a third 15-acre tract was planted with the trees 30 feet apart, making 720 trees in this orchard. The total number of transplanted trees thus became 1,440. All trees in the last planting were grafted in May with about 80 per cent being successful.

In these 45 acres of walnut trees, there are now about 1,000 which have been successfully grafted. The Thomas has been the variety mainly

used. Others used sparingly have been Ohio, Stabler and Ten Eyck. Last year (1932), the trees first grafted bore about a half-bushel of hulled nuts, as their first crop. In addition to these orchard trees, I have five others now about 10 years old from seed, which were grafted in 1926. These began to bear in 1929, and in 1932, four trees together bore about two bushels of hulled nuts.

The entire orchard has been permanently seeded to bluegrass. Twenty acres are used as a pasture for a 100-head herd of sheep. The remaining 25 acres are cut regularly for hay with which to feed the sheep in winter. The chief reason for seeding the land was to prevent erosion, although the trees would probably make better growth if the soil were cultivated. However, the trees are getting a certain amount of compensation in that all of the winter manure from the sheep is drawn out from the barn and spread upon the land.

This plan of handling the orchard may not be best for the trees, but everything considered, under my conditions, it does not appear to be a poor one. For the present, I mean to continue to follow it until experience indicates that some other would be better.

In regard to the future of the industry, no one knows what to predict. In 1927, when my first walnuts were planted, kernels were bringing from \$1.00 to \$1.25 per pound. It seemed reasonable to estimate that a 10-year grafted tree would produce a half-bushel of hulled walnuts per year.

With ten living trees to the acre, this would make five bushels per acre. Estimating ten pounds of kernel per bushel, this would mean 50 pounds per acre or from \$50 to \$62.50 gross. Under my plan of management this would require practically no work during the summer months.

These estimates, of course, do not apply under present prices. However, there are two things I can say without fear of being challenged. One is that the trees are growing just as well as though there were no depression, and the other is that during the summer I get great satisfaction in watching them from day to day, week to week, and month to month. The flowers appear late in May or early June, and from then on there is much joy in counting the nuts on tree after tree, and row after row, and in making guesses as to how many bushels there will be at harvest time.

Getting down to truth again and discarding fancy for the moment, one can not accurately estimate what the future will bring forth to walnut growers. We know that the industry is in its infancy. We know also that grafted trees produce greatly superior nuts to those from seedling trees. Our trees are growing larger each year and naturally, we may expect them to bear larger and larger crops. Personally, I look forward to wonderful crops ten or twenty years from now.

Just how and where these nuts will be marketed are matters which can only be determined with the advance of the industry, but let us do a little more figuring and a little more guessing. Today, walnut kernels are cheaper in the stores than I ever knew them to be before. I understand that the present retail price is about 35 cents a pound. These kernels come mostly from mountain districts of the Virginias, Kentucky, Tennessee, and North Carolina. In those sections the nuts are gathered in a more or less hap-hazard way. The methods of cracking, grading, packing and shipping are no better. The nuts often lie on the ground until the hulls are black and soft, and the kernels water-soaked. Regardless of how they are handled later, the kernels from nuts so handled can never be first-class. Nuts from my trees will be gathered as soon as they drop from the trees and while the hulls are still green. They will be hulled by the shovelful through a machine; and as soon as hulled and cleaned, they will be spread on racks to dry. I assure you that when these nuts are cracked, the product will be well worth while, and that I will not need to be ashamed to place it on the market at a fair price. I really believe that once the public comes to know this kind of a product, the black walnut kernels from wild trees will stay in the mountain districts of the South.

The Place for Nut Trees in Pennsylvania Horticulture

PROFESSOR F. N. FAGAN
State College, Pa.

It is not at all singular that land owners of Pennsylvania should take considerable interest in nut planting during times of economic depression like the present. When times are normal and there is fair demand for agricultural products of all kinds at good prices, there is no special incentive to try new crops for which returns are uncertain. It is only when the regular things fail to sell well that the urge becomes strong enough to compel active interest in the unusual things. That there is a very live interest in the possibilities of nut growing in this State is proved by the fact that right now the Experiment Station at State College is receiving more inquiries about nuts than ever before in the history of the institution.

Way back in the years of 1912-13-14 and 15 the Station received a great many inquiries along this line, but with better times, they dwindled to practically nothing. Between 1917 and 1929 the question was seldom raised. Now when two or three pounds of Persian (English) walnuts at 35 cents a pound, the present price on our local markets, will buy a whole bushel of the finest grade peaches or apples, as was the case last summer and the summer before, it is inevitable that there should be renewed interest in the possibilities of nut growing.

Greatest interest in any one species seems to center in the Persian walnut. However, that species does not appear to be adapted to all parts of

Pennsylvania, despite the hundreds of fine bearing trees that are familiar objects in the southeastern section and also along a narrow border skirting the shore of Lake Erie in the Northwest. Elsewhere within our borders there is great variability in the ability of trees to withstand the climatic rigors. Occasional trees may be found in especially favorable sites, where they might least be expected, but it is the exception that proves the rule and upon investigation, it seldom fails to develop that these trees are the only ones in those sections to have survived among dozens, if not hundreds that have been planted in the neighborhood since it was first settled. The others have all passed out leaving no written history of their futile existence.

It is my personal conviction that the future of nut growing in this State lies not so much in large commercial orchards as in home plantings. Still referring to the Persian walnut, the adaptability of that species to even our most favored sections is too uncertain to justify much hope of successful competition with the California or imported products. If poor land could be used for the purpose the situation would be entirely different. The development of nut orchards would then not need to interfere with our established forms of agriculture, but, walnuts of all kinds, and hickories as well, thrive only in first class grades of soil. In so far as soil is concerned, nut trees of well

chosen kinds, thrive in direct proportion to the fertility and moisture supply of the ground in which they stand. It is a sad waste of money, time and effort to plant nut trees in any but the choicest land available.

Walnut and hickory trees are large growers and must have abundant space in which to develop. Eighty feet each way in planted rows, is probably not too much for full grown trees. At these distances, it is of course possible that inter crops might be grown between the rows while the trees are young. However, in view of the uncertainties of outcome, the present is not a good time to plunge deeply in any new line of Agriculture. Pennsylvania has many established crops promising quicker returns and fewer uncertainties.

With reference to the black walnut, this species probably offers the greatest promise of return to nut planters in Pennsylvania of any species now available. Such varieties as Thomas, Ohio, Stabler and Ten Eyck have become generally well known. These are early bearers and the nuts of superior cracking quality. All are relatively new and may develop disqualifying defects, so it is probably well to include each in any planting. Experienced growers in other States are already giving conflicting reports of their experiences with these varieties. The question of varieties is a most vital one and every planter must be ever on the lookout for new and better kinds.

To my mind, it is very doubtful whether the shagbark and shellbark hickories will ever be able to compete with the pecan of the South. If hickories are ever found or bred with the thinness of shell and the cracking quality of the best pecans, they could undoubtedly compete successfully with

the southern nuts in our own markets, but until such hickories are somehow made available for orchard use, commercial hickorynut growing in Pennsylvania is likely to remain undeveloped. One who plants hickories or walnuts in orchard form must realize that he is going into a long-time venture of quite as much concern to the next generation as to himself, as the trees are all long-lived and from what we can learn, should be of greatest value after they have stood in place for at least a quarter of a century. They may pass their prime in 50 years but we like to think of them as still going strong 75 or 100 years hence. By this I do not mean to say that crops are not to be expected within reasonable periods of time after planting, as records already made in Lancaster County clearly show that black walnut trees compare favorably with apples in the age of first bearing.

There should be no mistaken ideas to the effect that nut trees have no natural enemies and therefore that they will not require spraying. Defoliated trees in late summer due to caterpillars or leaf diseases are common sights. Trees without leaves during July, August and September can neither develop plump kernels nor make buds for blossoms next spring. Nut trees in every other part of the country have to be sprayed. Likewise, every other kind of orchard tree in this section. Any other assumption regarding the future nut trees of Pennsylvania is but a case of a head buried in the sand upon the approach of an enemy.

Blight resistant strains of the native chestnut may sometime appear. So far as generally known, they have not yet done so. Individual trees which are believed to be such, may

be expected at any time, but their resistance can not fully be established until they have been definitely inoculated and tested in many localities under varying sets of conditions and during many years. The future experience with supposed blight-resistant native chestnuts will likely be much the same as has been that of the pear.

The question is often raised as to whether nut trees may not well be planted for the dual purpose of timber and nut production. However, the two ends are biologically opposed to each other. For timber, the trees should be and must be close together in order to force tall growth with a minimum of top, whereas for nut production, they must be far apart so as to encourage low, spreading tops with minimum trunk growth. Furthermore, only grafted trees should be planted for nut production and these are entirely too costly to produce in the nursery to justify planting for timber.

Filbert growing may have real possibilities of profit in this State. There are undoubtedly existing varieties which could be made to bear in many localities. The new Jones hybrids, not yet on the market in varietal form may be all that we hope, but here also, natural enemies must be taken into account. Thousands of plants of European varieties have been destroyed by a fungus disease, everywhere abounding on the native hazel, but becoming virulent upon the stems of the non-resistant varieties from the Old World. However, we look upon the future of the filbert in Pennsylvania with considerable hope.

In favorable locations, the pecan seems to be not entirely without a

place in the horticultural program of our people. It is essentially a more southern species and as a rule our seasons are too short for the nuts to mature. Even the late J. F. Jones, noted as he was for his sound optimism, and although he had a fine appearing orchard of pecan trees on his home grounds, at Lancaster, early concluded that the pecan offered no practical inducement as a money crop in Pennsylvania. On the other hand, when well grown, the pecan is second to no other species for ornamental use. As a tree, it often thrives several hundred miles north of the latitude of successful nut bearing. It is a rapid grower, symmetrical in form, typically not so dense of foliage as to entirely shade out grass and shrubs beneath its branches and it lives to great ages. Once in a great while, pecan trees in Pennsylvania produce crops of considerable size. Many of the numerous trees about the State blossom and set nuts with frequency. Quite often light crops actually mature, but we have yet to learn of a single case of pecans being produced in the State which were large and plump enough and in sufficient quantity per tree to be the least suggestive of commercial possibilities. Varieties of northern origin believed to be most suitable for home use are: Busseron, Posey, Major, Indiana and Niblack.

In conclusion, I would repeat my personal belief that for the home owner, nut growing in Pennsylvania offers much that is well worth consideration. By proceeding with caution, we may find large commercial planting abundantly justified after the experimental or test stage has been passed through in small family plantings.

Unusual Rhododendron Hybrids

BY JOSEPH B. GABLE

In a contemporary magazine a few months ago an article on the Botanic Gardens at Edinburgh stated that one of the most highly prized plants in the Garden was purely American, a hybrid of *Rhododendron maximum* and *R. minus*. Here a six year old plant of this same parentage, the last survivor of a numerous lot of seedlings, attained a height of one half an inch before its demise. Just why this discrepancy? Is the climate of Scotland more to the liking of a hybrid of two American species than America itself, are the Scots better gardeners, or is the result different where different plants are used in making a cross, though the hybrid be made between the same species in both cases? I regard the latter solution of this problem as the most likely. It may be worth while to try the above crossing again even though these species are far apart in relationship as rhododendron relationships go.

Rhododendron japonicum and *R. Kaempferi*, both azaleas but of different subseries, produced plants that in five years have not attained six inches in height and the most of which are now deceased. *Rhododendron japonicum* and *R. luteum*, azaleas of the same subseries that one would suppose would mate congenially, produced seedlings without cotyledons. To be sure they stopped where they started. In 1925 a plant of *Rhododendron mucronulatum* was forced into flower and in an idle moment pollen of the azalea "Hexe" (*Rhododendron obtusum* var.) was placed on a few stigmas. According to our systematists these species are as far, or farther

apart, in relationship as any of those mentioned above — notwithstanding that *R. mucronulatum* is sometimes listed as an azalea—the first mentioned belonging to the lepidote group of rhododendrons while "Hexe" is elepidote with both flowers and branches from the same terminal bud. Seed was produced which germinated poorly and irregularly but while some plants made indifferent growth or failed, others were very vigorous. One plant, excelling all the others in growth, produced single rose purple flowers of good size very early. After flowering it for two years, it was sent to the Arnold Arboretum. But it remained for the dwarf plant among the survivors, six inches high at six years of age, to produce the best flower, a hose in hose type similar to "Hexe" but lighter in color and larger, which is the flower illustrated. Of the nine plants of this parentage that lived to flower, seven produced single flowers and two hose in hose type flowers as in "Hexe."

Except for their botanical interest, none of these are worth a place in the garden, at least in this climate (Southern Pennsylvania) where they are none too hardy. They might be tolerated for their very early flowers in milder gardens.

Subsequent efforts to cross *R. mucronulatum* with several other azaleas of the *obtusum* subseries in an effort to obtain color and hardiness have all failed to produce seed except one. *R. mucronulatum* x (*R. yedoense* var. *poukhanense* x "Hexe") produced seeds and a few plants that have not yet flowered but one can not expect

much color improvement from such parentage.

I have no wish to pose as an authority in genetics and make the statement that *R. mucronulatum* will only cross with such azaleas of the *R. ob-*

tusum group as have "Hexe" blood. But these are the results of my experiments and if other trials along the same line have differed in result, I shall be very interested to hear of them.

A New Society

The American Amaryllis Society was organized on May 21, 1933, at a meeting of Amaryllis enthusiasts in Orlando, Florida.

The purpose of the Society was announced by the organizers as being the advancement of Amaryllis culture in general, including the introduction of new species, development of new varieties, improvement of methods of growing and propagation, and the stimulation of increased interest in this branch of floriculture.

The Society is planning to issue a yearbook of Amaryllis information in the near future, and material for the initial number is already in preparation. The Society proposes to direct its research and other efforts mainly in behalf of such types of the Amaryllis family as hybrid Amaryllis (*Hippeastrum*), Amaryllis Belladonna, *Clivia*, *Crinum*s, *Haemanthus*, *Hippeastrum* species, *Hymenocallis*, *Lycoris*, *Nerine*,

Vallota, *Zephyranthes*, and others composing the bulbous genera, and excluding the *Narcissus* group, the *Agavas* and similar plants.

Officers of the Society are: E. G. Duckworth, president; H. P. Traub, vice president; R. W. Wheeler, treasurer, and W. Hayward, secretary. Theodore L. Mead of Oviedo, Fla., veteran hybridizer and naturalist, is an honorary member of the Society. Dues of the Society are \$2.00 annually. The board of directors has voted to keep the charter open until January 1st, 1934 for the enrollment of charter members.

The Society hopes to sponsor Amaryllis shows for the popular presentation of new introductions and developments, and to make awards of merit for outstanding achievements in the Amaryllis field.

The address of the Secretary is 2240 Fairbanks Avenue, Winter Park, Florida.

A Book or Two

Fighting The Insects. By L. O. Howard. The Macmillan Company, New York, 1933. 333 pages, not illustrated. \$2.50.

When an interesting man writes an autobiography, it is usually inter-

esting reading. Leland O. Howard, until recently chief of the Federal Bureau of Entomology, is a very interesting man and he has just published his autobiography under the title "Fighting the Insects. The story

of an entomologist." The book is well worth reading, regardless of your personal interest or lack of interest in entomologists.

Born in Rockford, Illinois, about seventy-five years ago, Howard early came to Ithaca, N. Y., with his parents. It was here that his boyhood was spent. Entering Cornell University with the class of '77, he devoted much of his time to entomology under Professor Comstock and was graduated in due time with a desire to enter the teaching profession. Instead, upon advice of friends, a year of graduate study along medical line followed. An opening in the Federal Department of Agriculture as assistant to C. V. Riley, the then only government entomologist, seemed to offer promise and in November, 1878, he entered the service.

From this time until 1894, Howard served under both Riley and Comstock. While he says little, it is evident that work under these men was not entirely pleasant. He makes it plain that having all of his work published under the name of the chief did not sit well and in later years he was scrupulously careful to give credit where credit was due. In 1894, Howard became chief of the Division, later the Bureau, of Entomology. Here he found less time for research but more for travel. It is doubtful whether any other chief of a scientific branch of the government service has spent as much time away from Washington as he has. However, the service has benefitted by this travel, for the contacts established in the various European countries have been invaluable in the task of securing the needed parasites for the control of our imported pests. In 1927, at the age of 70, Dr. L. O. Howard retired from the position of Chief of

the Bureau and in 1931, severed his active connection with the government service.

The author has either enjoyed his life and work to the utmost or else he has been very successful in forgetting the disagreeable happenings. No matter what he writes about, he is reminded of an amusing anecdote. Perhaps for the average reader there are too many of these asides, perhaps not. His personal convictions of course color the selection of these stories and it seems unfortunate that no one has ever told him that the war with Germany is over. Those who know Dr. Howard will make allowance, for beneath he is a kindly soul and the portrait drawn in this book is true to life.

How Plants Get Their Names. By L. H. Bailey. The Macmillan Company, New York. 1933. 209 pages. \$2.25.

One of the very pleasant things about growing old in gardening is that one discovers other interests beyond the first athletic activities of cultivation. The historical backgrounds in which horticulture and botany have met and parted so often and in which the continuing efforts of botany have made much work for the gardener and his learning of names and of new and even newer names for his familiar plants, should be one of the fields the adult gardener should know. This book by Doctor Bailey, so long distinguished for his careful researches, is written for the gardener and is well worth his reading and study. It is concluded by two lists, one for pronunciation of generic names, the second, of specific names, with definitions appended.

The History of the Garden. By Eleanor Sinclair Rohde. With a chapter on American Gardens by Mrs. Francis King. Hale, Cushman & Flint, Boston, Mass., 1933. 326 pages. Illustrated. \$4.50.

In the midst of our own garden making, often so hurried, so ardent and so horticulturally knowing, it is sometimes well to pause for a backward look at the road by which we and our forebears have come to the present day.

Miss Rohde's book is more concerned with the garden and its history than with gardening and plants, yet we see how the plants grown at various times have set their mark upon garden styles through the necessities of their culture.

The book is beautifully printed and illustrated and the same taste that has seen to these physical perfections actuates the text, a text that it written with charm and style, covering the periods from those early days conveniently set down as "ancient," through mediaeval gardens to those of Tudor England, the gardens of the Stuarts, the period when French and Dutch influences appeared, the Georgian Period, the "Landscape School" and finally more recent, but not modern, England.

Mrs. King's chapter is inevitably brief but it touches upon some of the important times and places, written beautifully as always.

There is a long bibliography of references.

Climbing Roses. By G. A. Stevens. The Macmillan Company, New York. 1933. 220 pages. Illustrated. \$2.00.

A useful handbook, redolent of the rose atmosphere of Breeze Hill and

filled with illustrations both in color and in black and white, some new, some old and familiar. It is concise and arbitrary, bringing together much historical data, a summary of the current practice, and a descriptive list of varieties, that might serve at least as a point of departure.

The Florist Business. By Edward A. White. The Macmillan Company, New York. 1933. 426 pages. Illustrated. \$4.00.

As one of the books of The Rural Science Series, this volume is written in such a way as to present a maximum amount of last minute information on all the interests that converge in the florist's business. To the readers of this quarterly, the book will be a revelation of what lies behind the scenes that they know only in the ultimate florist's shop.

A recapitulation of the index will give as clear an idea of the content as any comment. The book is divided into two parts. The first, Factors in Flower Production and Distribution, contains: The Florist Industry and Its Present Status, Factors that Have Influenced the Improvement of Flower Crops, Locating a Greenhouse Range, Modern Greenhouses, Types of Construction, Heating, Management and Equipment, How Plants Grow, Plant Reproduction, Greenhouse Soils, Business Management, Markets, Packing, Insects and Diseases. The second part, far shorter in length, deals with the principal "Florist Crops and Their Methods of Culture."

Lilacs in My Garden. By Alice Harding. The Macmillan Company, New York. 1933. 87 pages. Illustrated. \$1.50.

This is a small and rather personal work, delightfully written and fired by the enthusiasms of the writer. For the person who has never grown good lilacs, it should be the spark to kindle his desires; for the person who already has tasted the delights of lilac growing, it should be the spur for further pleasures.

It is compact, almost to brevity, but full of pleasant comment. One learns the author's preferences as to varieties and species, her vicarious adventures in propagation and her Gallic prejudices.

Informal Gardens. By H. Stuart Ortloff. The Macmillan Company, New York. 1933. 115 pages. Illustrated. \$1.60.

The informal garden is always the most difficult to champion, because its beauties are those least possible to label and while Mr. Ortloff has brought to the reader's attention, most of what the reader should remember, it is perhaps doubtful if he has done more than any of those who have dis-

cussed this theme before. The illustrations are routine, the suggested plans pleasantly simple but accompanied by plant lists that are more than hackneyed and of use only in the North.

Since most informal plantings fail, no matter how well planned, if they do not have continuous and more than intelligent maintenance, it is particularly a matter for regret that the chapter on that subject is so brief.

Delphiniums. By G. A. Phillips. The Macmillan Company, New York, 1933.

Written and printed in Great Britain, this volume does not suffer as much in its transplanting to this country as do many British books, since the author has apparently been in touch with some of the leading delphinium growers of this country. It will remain, however, of chief value here in that it points out all of the essential matters that are related to any plant that becomes the subject of specialized cultivation.

The Gardener's Pocketbook

Acacias Native to the Southwest.

In addition to those Acacias that are native to Australia, New South Wales, Queensland, tropical Africa, Ceylon and India there is a large group that have North America as their native habitat. Asa Gray says, however, that there are "no native species north of Texas," and Dr. L. H. Bailey in his *Cyclopedia of Horticulture* lists and comments on several of these our native Southwestern acacias.

Locally our acacias are known as various Catclaws or Devil's Claws, such as "Round-flowered," "Long-flowered," "Black-brush," and "Thornless" Catclaws (the "Huajilla"), and the "Huisache." All are native to the limestone hills and plains, fairly widespread in habitat especially along the coast of Texas into Mexico. Also, all of our acacias are of the Mimosa family—are Mimosaaceae—their leaflets being (some of them very) sensitive and their fluffy

white or yellow flower-balls very fragrant.

The Huisache (pronounced "we-satch")—*Acacia Farnesiana*, is a much branching, thorny shrub that grows from six to ten feet or more in height. Its origin is disputed, but Bailey says "probably American, but it is now naturalized in nearly every tropical country." In France it is cultivated for making perfumery. Its deep yellow, fluffy flower-balls or heads, the size of small marbles are extremely fragrant and attractive to honeybees. The early pollen (although not to be depended on since it blossoms intermittently, according to Ellen D. Schultz) is therefore a valuable asset.

There are at least three varieties of the Huisache, all graceful plants with their drooping branches and arching stems. One variety produces two crops of flowers during the year, and its pods are said to contain a tannin, making it very lucrative to perfumery manufacturers. Gray says the other yields gum arabic. The pods are cylindrical, varying from an inch and a half to three inches long, and turn dark reddish brown as they age.

Huisache prefers moisture and rich soil, although it grows in the open field and on mesquite flats. The dwarf form, *Acacia tortuosa*, is found along the coast and attains from one to ten feet in height, although usually a low shrub, differing as greatly with its wider branching limbs from the taller more erect form as do the mountain and the lowland pines in their general appearance.

There are two native thornless acacia shrubs in our Southwest—*Acacia berlandieri* being taller (from two to ten feet in height) the *Acacia filicioides* or *flicina* which rarely reaches three feet in height, its stems dying

to the ground each year. Its flowers are fuzzy white, orange or yellow balls, composed of stamens crowded in clusters the size of marbles, and its foliage is more fern-like in appearance than most acacias. Its seed-pods are flat, not pulpy, and its "bitter bark called *timbre* is used by the Mexicans in making pulque for precipitating mucilaginous matter," as Bailey comments.

Acacia berlandieri may be native to Mexico only, although this is disputed. Its branches are ashy-grey and its pods are longer than *Acacia filicioides*, and it does not die to the ground each year. It is especially abundant in the sandy loam of southwestern Texas. Both the thornless acacias, the "Huajillas" (pronounced "wa-he-ya"), bear very fragrant blossoms and resemble the other Catclaws in every way except they lack the spines.

Perhaps the longest thorns on our Catclaws are borne by *Acacia amantacea* DC., the "Black-brush Catclaw," a shrub armed with stout straight spikes on arching branches that sometimes are twelve feet high and often are so interlaced and thick that the mass is impenetrable both to man and animals. The foliage is a glossy, dark green and the flowers pale yellow, or white turning to yellow with age, invaluable as a source of honey, as are all the southwestern acacias.

Acacia Greggii is armed with shorter, recurved spines than is *Acacia roemeriana* Schlecht the "Round-flowered Catclaw," which is one of the least desirable of our acacias as garden shrubs, as its stout thorns are merciless to clothes and flesh. It has fluffy fragrant flowers that look like white or pale yellow fuzz, and the seed-pods turn a dark red as they



K. N. Marriage

Boykinia Jamesii

K. N. Marriage

Saxifraga chrysantha

ripen. *Acacia roemeriana* is a lower growing shrub, however, than is *Acacia Greggii*—widely known as the Texas Mimosa—which is sometimes a twenty-foot tree, although generally not so tall. Its flower-spikes are cream yellow, with petals and sepals a bit greenish growing in compact oblong clusters. It is sometimes called the "Paradise Flower" although it is best known locally as the "Long-flowered Catclaw."

Most of our acacias are said *not* to be *hardy* where the ground freezes, although there has been very little experimentation with their cultivation. Few of them can be purchased, for the demand for them has as yet been limited. Personal experimentation with Huisache has been that it will survive below freezing weather, although killed to the ground on the unusual occasions here (in Dallas) of near zero weather for six to eight hours. Two other most desirable, semi-tropical, native shrubs—*Senisa* (*Leucophyllum texanum*), our wild lilac or Barometer bush; and the *Agarita* (*Berberis trifoliolata*)—will also withstand an equal amount of cold without protection.

MARIAN AND MARGARET SCRUGGS,
Dallas, Texas.

Two Pike's Peak Saxifrages

Boykinia Jamesii (syn. *Saxifraga Jamesia*) is one of these choosy things as to distribution. It is found about 12,000 to 13,000 feet altitude, here and there—mostly there—on Pike's Peak. Whole patches of deep green toothed leaves, evenly pleated on the rocks from which rise dozens of perky 6-inch stems bearing heuchera-like flowers of deep rose pink—not magenta and not purple—really the very tone of *Primula angustifolia*, its near neighbor. The habit and texture of this make it one of the loveliest of our natives and it seems to be entirely adaptable always presupposing a diet of grit and leaf mold. Chipmunks see to it that not much seed is available in the mountains.

Saxifraga chrysantha covers large areas of disintegrated granite 13,000 to 14,000 feet high on Pike's Peak where pickings in the way of organic matter are still thin. One of the tiniest, daintiest of the saxifrages, miniature rosettes ¼-inch in diameter bearing little cups of clear daffodil yellow on 2-inch stems. A profuse bloomer and evidently adaptable.

MRS. G. R. MARRIAGE,
Colorado Springs, Colo.

Two Ladies from Spain

The two little ladies from Spain and Portugal are two wild daffodils, *Narcissus cyclamineus* and *N. triandrus*, miniature flowers with just enough daffodil look about them for us to recognize their kinship to the big breath-taking daffodils of modern gardens and bulb shows. Their dainty size suggests their use in the rock gardens, and I like to see them in children's gardens.

Narcissus cyclamineus, the Cyclamen daffodil is a elfin thing, four inches high in our garden, though the books say six, and W. E. Th. Ingwersen tells of finding it eighteen inches high in the wet meadows of its native Vallonga. The inch-long, deep yellow blossom is borne singly on a slender but sturdy stalk, rising between two dark green leaves. The perianth segments after the first day of bloom are turned tightly back upward, giving the flower a perky look, like an alert elf with pointed ears.

Those who have collected it will note that it likes granitic soil, not lime, and recommend for it a moist spot such as a pocket between stones near a rock edged pool, or a raised place near, but above a bog garden. In our garden it has none of these things, but pops up cheerfully year after year, in a small, well-drained nook in full sunshine in the rock garden. There is no granite within miles of it, and the soil is rather poor and gritty, so perhaps that is why it is so small and precious. It remains in bloom a long time—February 24 to April 18 last year—and when the flower withers at last, there is discovered behind the upturned perianth segments a fat, nearly full-grown seedcapsule.

One thing the flower is accustomed

to at home, we can give it here in Portland, Oregon, and that is plenty of rain during the blooming season, followed by a thorough sun-baking in the dry months of July and August. In the eastern states, where the summer dry season is longer and the springs less mild, no doubt the plant should have everything the books say to give it.

Now of course the hybridists could not keep their hands off this delightful little flower, and it is a good thing for the garden that they could not. The results of their experiments include a number of fine named daffodils that show unmistakably the cyclamineus parentage. Two that are not too tall for places in the rock garden, are February Gold and March Sunshine. The first is almost as early as the Cyclamen daffodil, and is about 13 inches high, with upturned segments of a slightly lighter shade than the bright yellow trumpet. It lasts on to dance in the winds of March, or in backward springs, does not bloom till March. Before it has passed, March Sunshine comes into flower, less sturdy in appearance, with slenderer stem and more gracefully poised blossom.

If *cyclamineus* is an elf, then *Narcissus triandrus* is a fairy. In its white form, *N. triandrus albus*, the Angel's Tear daffodil, it grows seven or eight inches tall, and the little drooping cream-white bells with fly-away reflexed segments are borne in twos and threes. They have a sweet jonquil fragrance.

The flower is usually recommended for partial shade, but it does very well in Portland on a sunny well drained rocky bank, where it can bake all summer. I found a self-sown seedling blooming this spring in a



George G. Stephenson

Narcissus cyclamineus

crack in the ledge where the point of my little pick could not enter at all, to pry the crevice open. If I had been able to open the crack and remove the bulb, it would have undoubtedly been a flat disk-shaped thing, instead of globular, for there was no space to expand at all. Yet the flower seemed happy enough, in a year when many delicate things perished of the severe winter and spring freezes. Though this flower looks less sturdy than cyclamineus, it does have more resistance, perhaps because

it is slower to push up its leaves, and *cyclamineus* in bad years, gets these nipped off and so weakens the bulb. I have recently noticed triandrus flowering happily in shade on the north side of a small Mugho pine, and also in a recess at the foot of an east facing stone wall, where moisture and afternoon shade were evidently its portion. These were taller plants than the ones in the sunny place described above.

Several natural varieties of *triandrus* are in cultivation. *Concolor* is



Frank I. Jones

Narcissus triandrus albus

a uniform soft yellow, often almost as pale as albus, in the deeper cream specimens of the latter. Height and season are identical with albus. *Pulchellus* has small clustered bells with the cups shorter than albus, primrose yellow perianth and the cup a bit lighter. *Calathinus* has larger flowers than the rest and is an exquisite, cream-colored flower with leaves that are flattened like some alliums, and stiffly curled. All these miniature daffodil species and varieties I have mentioned are best increased by seed, though the method, of course, is not recommended for the hybrids.

There are a surprising number of hybrids of *N. triandrus*, one of the best known being a natural hybrid found growing wild in Spain, and named the Queen of Spain. It is bright canary, a foot high, charming in a large grouping, either in the rock garden or along a path in dappled shade.

Pearly Queen and Moonshine are more costly, and very lovely white things. Shot Silk is a new and beautiful one, with clustered white drooping bells of wonderful texture, but the loveliest lady of them all is Thalia. A friend left two flowers of it on my doorstep and I took them out and stood them up beside their fairy grandmother, the Angel's Tear. Thalia's petals were glistening silvery white, borne on stalks twice the height of the other and the flowers twice as large, her bell-shaped cups were not so deeply drooping, nor the perianth so fully reflexed, yet she seemed fully as graceful a flower as her fairy grandmother.

The time to see these daffodils is at the spring bulb shows, the time to order them is summer, so as to secure the desired sorts before stocks are exhausted, as the supply in the United

States is limited; the time to plant them is early in September, so they can get well settled and benefit by the first fall rains. However, they can be safely set out at least a month later.

DREW SHERRARD.

Oswego, Ore.

Muscari

Muscari (Latin name referring to the musky odour of *M. moschatum*), grape hyacinth. Liberty Bailey in his *Cyclopedia of Horticulture*, says "the group needs botanical revision badly." It certainly does, and one realizes too, the errors of even the best European dealers in their catalogues—those catalogues that we respected mightily in those past happy years when we poured over their lists with joy, ordering what we wanted forthwith, for all seemed and were actually so marvellously cheap.

In the hope of correcting some errors in nomenclature in my own varied collection of Muscari, I subjected their names to scrutiny. First *M. botryoides*, the type, the common blue-bottle naturalized in some places in this country and becoming so in my ground. I remember as a child being delighted by the first ones I had seen on the ramparts of old Fortress Monroe at Hampton Roads, Va. I have it now also in white, it always seems the daintiest of spring flowers for a guest bouquet, which one tries to find time to slip in their welcoming room.

M. comosum, or *plumosum*, or *commutatum*, or even *M. plumosum monstratum* for under all these titles and pseudonyms the Feathered Hyacinth is sold, I had, and may still have, for it is as shy in flowering as the Parrot Tulip and may spring up one year to surprise you, and then

go into a convent for the next succeeding ones.

One of my muscari has long puzzled me, for it came from Holland under the name *M. macrantha* and in looking it up in my only authority handy at that time, John Weathers' Book of Bulbs, an exhaustive and correct work, I found he listed no *M. macrantha* whatever. Deciding to be more positive about it, I started in on Bailey reading his remark quoted at the beginning of this paper, I travelled far and now add my little bit to the needed revision of the group.

First I found that while Bailey listed a *micrantha*, it meant precisely the opposite of *M. macrantha*. *Macranthus* = large flowered says the glossary, while *Micranthus* = small flowered. Whether the Dutchman who sent me my bulbs knew his Latin well enough to discern the difference these two vowels would make in the description of the variety is not certain but he struck the correct one, in one respect, for my *M. macrantha* is large flowered, but it is very dark, almost black blue, while Bailey *Micrantha* is small flowered and described as pale blue.

The only one in Bailey's long list that in any way fits my fine large dusky black blue spikes is *M. paradoxum* and as the name had B. M. 7873 added to it, I looked up Curtis' Botanical Magazine and found the fine coloured plate which this initial and number denoted, in Vol. LIX, 1903, and set it up before me for study.

The Botanical Magazine listed Muscari as of course belonging to the order of Liliaceae, but that they used to be called Bellevalia, and also belong to the Tribe Scillae—this gives them more cousins and aunts than before, a bewildering array. The plate

of *M. paradoxum* is certainly like my variety and I read its description "it is a native of Persia, and was discovered by C. Koch in the Russian province of Erivan in the Transcaucasus—it was flowered in the open air at Kew in May, 1898, and subsequently and is the most handsome species of the genus."

I cannot quite agree with this, though the word handsome has its own connotation to different people. To me, a well grown *M. botryoides alba* is a more beautiful thing. Ah! I note there I said "beautiful" so truly enough "handsome" may well be selected as picturing the tallish, dusky purple or violet black spike with its tubular flowers closely packed about its scape, the trumpet end of the tubes hanging downwards and full of nectar evidently, judging from the crowds of bees that flock about my groups on May mornings. They are later flowering than the little blue-bottles and are very sturdy, doing well in poor soil and crowded quarters.

If mine is *M. paradoxum*, and it can be no other, for no other is described as being such a dark blue, or having such wide strap like leaves, then the plate in Curtis' Botanical Magazine is not dark blue enough to be precisely a match for my flowers, yet one cannot rely entirely on these colour plates, fine though they are—color connotation is as varied as that of words, and our climate and soil may influence them to assume a darker colour than they show in England.

FRANCES EDGE MC ILVAINE.
Downingtown, Penna.

A New Arboretum.

The Morris Arboretum in Chestnut Hill, which was bequeathed to the

University of Pennsylvania by the late Miss Lydia Thompson Morris, will be formally dedicated at exercises to be held there on Friday, June 2, it was announced today by Thomas S. Gates, president of the University.

On Saturday, June 3, there was a private viewing of the arboretum by officers and members of various horticultural societies and by others actively interested in the promotion of horticulture, and on Sunday, June 4, it was opened for the first time for inspection by the public.

The program for the dedicatory exercises on June 2 was opened with a scientific session conducted at the arboretum at 11 o'clock with President Gates presiding.

At this session addresses were made by President Gates; Dr. Rodney H. True, chairman of the department of botany at the University of Pennsylvania and director of the Morris Arboretum; Dr. A. H. Reginald Buller, professor of botany at the University of Manitoba, and Dr. Robert A. Harper, who is Adrian professor emeritus of botany at Columbia University.

Following the scientific session officials of other well-known arboreta, distinguished scientists and men prominent in various other fields, who were among the University's guests, attended a buffet luncheon at the arboretum.

A convocation, held there at 3 o'clock on the afternoon of June 2, was featured by an address by Dr. A. Lawrence Lowell, president of Harvard University, and by the conferring of three honorary degrees. In addition there was a brief ceremony during which custody of the arboretum was formally transferred to the University.

Preceding the convocation, over

which President Gates presided, was a formal academic procession. The Rev. W. Brooke Stabler, chaplain of the University and Boardman Lecturer on Christian Ethics, gave the invocation, and the ceremony of transferring custody of the arboretum will follow.

In this ceremony Maurice Bower Saul, attorney, represented the executors and trustees of the Morris estate, while President Gates accepted custody of the arboretum on behalf of the University.

At the conclusion of his address, the degree of doctor of laws, was conferred upon President Lowell, and the degree of doctor of science upon Dr. Buller and Dr. Harper, speakers at the morning scientific session.

For the private viewing on Saturday, June 3, the arboretum was open from 10 A. M. until 5 P. M. For the public inspection on Sunday it was open from 1 to 6 P. M.

The Morris Arboretum, which overlooks the picturesque Whitemarsh Valley, consists of two estates of approximately 160 acres upon which Miss Morris, who died on January 24, 1932, and her brother, the late John T. Morris, developed one of the finest collections of botanical specimens in the United States.

One of these estates, "Compton," where Miss Morris made her home, lies in Philadelphia county, while "Bloomfield," the adjoining estate, is situated in Montgomery county.

Compton includes about eighty-five acres of highly diversified land with hillsides and valleys and several small streams. The original estate on which the residence now stands was first planted by Mr. Morris, but subsequently additional land was purchased and on this land later plantings were made by Mr. Morris and,

after his death in 1915, by Miss Morris.

With its wealth of trees, open stretches of lawn and meadow, plantings of non-shrubby character, winding brooks, grotto-greenhouses and excellent examples of ceramic art and statuary, the arboretum offers a variety of attractions both to the layman and the scientist.

Many of the shrubs and trees are rare specimens introduced from China and other parts of the world through cooperation with Dr. Charles S. Sargent, for more than fifty years the director of the Arnold Arboretum, and through cooperation with the Arnold Arboretum in the many expeditions of E. H. Wilson, its late keeper.

There is an exceptional collection of coniferous evergreens, including African, Australian, Asian, European and North American species, while the Thorn apples, Japanese cherry trees, magnolias, the golden oak, the turkey oak, the sour gums, Chinese elms, yews and the rare *Davidia* from Western China also claim admiration.

Non-shrubby plantings are found in the small formal garden enclosed by its walls and in the long winding border along the lower course of the lawn brook.

Of unusual interest to the plant lover are the grotto-greenhouses which shelter the ferns and selaginellas. The fern house was designed by Mr. Morris personally and on its moist stone wall is a growth of filmy ferns which is particularly worthy of attention, for the leaves of these tropical specimens are only one layer of cells in thickness over the greater part of their area.

Enhancing the value of the arboretum to students of botany are a botanical library and the nucleus of

an herbarium in which are collections of dried specimens intended in time to show flowers, seeds stems, and foliage of all types in the arboretum.

These collections, to which others will be added later, are supplemented by the University of Pennsylvania's present botanical library of 12,000 volumes and its herbarium of 115,000 specimens and many photographs.

In addition to bequeathing the arboretum to the custody of the University, Miss Morris also left the residue of her property, after certain bequests, to constitute an endowment for the arboretum's maintenance and development.

This generous provision for its future, together with the magnificence of the arboretum as it now stands, give promise that Philadelphia will have in the Morris Arboretum an institution comparable to the great Arnold Arboretum in Boston, the Royal Botanic Garden at Kew, England, and other notable arboreta throughout the world.

Grevillea thelemanniana Hueg.

Grevillea thelemanniana is an exceedingly pretty dwarf ornamental shrub for a cool, or intermediate greenhouse. There are about two hundred species of *Grevillea* and they are nearly all Australian plants, and *G. thelemanniana* is one of these.

I have had a plant about three years and it is growing very contentedly in a 5½-inch pot. For two seasons it flowered from October right through the entire winter until April, and gave its flowers profusely. These are of a brilliant shade of red and are claw-shaped, and most unusual looking. The foliage sets off the flowers to perfection. Its very

pretty pinnate leaves are linear, and make a fine and feathery appearance. It is of a spreading growth with a tendency to droop.

Planted out, it is said to attain a height of three to five feet, but in a pot it is slow growing, and after flowering it can be trimmed to a desired shape.

My *G. thelemanniana* seems to enjoy its rooting medium which is composed of a good loam with a generous admixture of fine crushed stones, peat, and a few coal ashes.

This little flowering shrub has another great advantage, and that is that the hot, dry atmosphere of the house seems to have no deleterious effect on its health; for my small plant spends weeks at a time on a window sill where it gets very little attention, and is exposed to both drafts and high room temperatures, and rather careless watering.

It has even been subjected to frost upon several occasions, and suffered no ill effects.

There are so many beautiful Australian plants, and as these usually seem to thrive in a mixture containing much sandy peat, and in their own home bear quite low temperatures, it is surprising that those who live in our favored Southern States do not use them generously for outdoor planting; and that those who have greenhouses in the North do not take more advantage of their winter beauty for indoor decoration.

MRS. J. NORMAN HENRY.

Gladwyne, Pa.

Leptodermus oblonga Bge.

Leptodermus oblonga is a dwarf hardy deciduous shrub of real value. Its home is North China and it was introduced in 1905. The very pretty

light purple flowers are tubular with spreading lobes. These are borne in clusters on the ends of the branches of each season's growth and are well set off by the healthy deep green foliage. They bloom in September and continue to open until frost.

In 1928, my esteemed friend, Dr. E. H. Wilson, sent me a plant of *Leptodermus oblonga*. It is now three feet high and three and one-half feet across. It is growing in ordinary loam in full sun and has never had protection of any kind, although it is planted in an exposed situation. This plant has bloomed profusely, even when very small the first season. Its purple flowers coming at this time are extremely welcome.

It never makes a great show and of course will never attain the popularity of forsythia, and for this I am glad. But anyone fond of shrubs and who is interested in something very pretty and a little out of the ordinary, might well appreciate this little bush.

MRS. J. NORMAN HENRY.

Gladwyne, Pa.

Styrax obassia Sieb. et Zucc. (See page 278).

Although the plant from which the illustration was made had flowered before, neither it nor its fellow seedlings had bloomed sufficiently to show their mature effect nor to fill the air with their delicious and pervasive scent. Consequently, nothing had been done to hunt for references to the early garden history of the plant.

Native to the southeastern parts of Japan and of Korea, this plant is reported to be as hardy as *Styrax japonica*, long grown here and self-sowing as freely as any native. Whether or not this species will self-sow remains to be proven.

It begins life rather slowly as a seedling and makes scanty growth for several years and then begins a more luxurious increase, marked by the astonishing size of the leaves, like huge soft linden leaves, and the interesting, exfoliating bark. My seedlings, about eight years old, are now over ten feet high with smooth, adult bark and many flowering spurs from which depend the long inflorescences so clearly shown in the illustration.

The original figure in Siebold and Zuccarini's *Flora Japonica* shows the same habit but flowers with narrower lobes and correspondingly less showy. A slight variation of this sort occurs among my plants. This is objected to by the author writing in *The Gardeners' Chronicle* for Aug. 4, 1888, who insists that the illustration in Siebold and Zuccarini is "too pendulous." The figure in *Gardeners' Chronicle* is certainly erect as is the figure in *Curtis' Botanical Magazine*. The latter text comments upon the discrepancy.

Whatever the basis of the original controversy, all the plants seen here have pendulous inflorescences and delightful flowers that fill the air with their scent. They open here in Mid-May and have fallen before those of *Styrax japonica* are in full flower. Is it not curious that so striking a flowering tree, described in 1835, and introduced into England by the famous collector, Maries, through the equally famous nursery of Veitch & Sons, awarded a First Class Certificate by the Royal Horticultural Society in 1888, should be so little grown. Does the difficulty lie chiefly in the indifferent behavior of the plant in transplanting or is its charm too evanescent?

Washington, D. C.

Prunus serrulata Lindl. Variety *Shirotae*. Oriental cherry. (See page 275).

About the time that the delicate pink double flowers of the early-blooming Takasago (see *NATIONAL HORTICULTURAL MAGAZINE*, Vol. 9: 160, 1930) are at their best, the first blossoms of *Shirotae* commence to open. There is something delightfully restful in the appearance of the double-white flowers against the pale-green background of the young foliage, which has but an occasional and inconspicuous, light-brownish tinge. *Shirotae* is the best representative of the group of double-white oriental cherries, and the only one grown to any extent outside of Japan. Its name, Japanese for "snow-white," is well applied even though there may be slight pinkish tints on the younger buds and on the lower side of some of the petals.

Shirotae develops normally into a rather large, wide-spreading tree, sometimes as much as 25 feet high, branching from near the base of the trunk. The branches and trunk are dark gray, and the twigs brown, while the young foliage, which commences to appear when the flowers are almost fully opened, is pale green with occasional slight brownish hues. The mature leaves are elliptic and long acuminate, with petioles up to 1½ inches long, and blades 3 to 4 inches long. The margins are finely and doubly serrate-aristate. The slender, pale-pink flower buds are inclosed by a reddish brown calyx with coarsely toothed sepals, and the semi-double, white flowers, 1½ to 2 inches across, more or less campanulate, are in somewhat pendulous clusters of two to five. The petals are not flat but ruffled, which makes the flowers



Lilian A. Guernsey

Styrax obassia

[See page 271]

appear more double than is actually the case, and occasionally there may be seen pinkish tinges on the lower side of the outer petals.

In younger trees the flowers sometimes have only a few extra petals, and may even be single. Single flowers also appear rarely at the very end of the flowering season. Shirotae is now and then confused with the double form of the sweet cherry (*Prunus avium* L.), but the sepals of the latter are decidedly reflexed, and the flowers are more double and smaller.

There are, it is true, many so-called "double-white" oriental cherries—these include several semi-double varieties (with 15 petals or less), with relatively small flowers, and also a number of slightly pinkish varieties with more petals. In this category also should be included the Double Chinese cherry, that will be described in some future number of this magazine. This has small, double-white flowers, and although unknown in Japan, agrees botanically with the largest group of Japanese cherries, and is the variety on which the English botanist Lindley based his original description of *Prunus serrulata*, more than a hundred years ago.

Miyoshi (Japanische Bergkirschen, p. 92) describes Amayadori, a semi-double form very similar to, possibly identical with Shirotae. Wilson (Cherries of Japan, p. 48), also briefly characterizes Amayadori, but states that he had not seen it in bloom.

It is a rather curious fact that, among the many diverse forms of Japanese cherries, there is no double, pure-white variety of exceptional merit. A pure-white cherry with the size, number of petals, and floriferousness of the double-pink Kwan-

zan would be worth getting on one's knees to.

Shirotae is one of the more common varieties in the trade, and is sometimes listed as Mount Fuji. The latter name, given in some Japanese and American catalogs, has led in at least one instance to confusing this with the Fuji-zakura (*Prunus incisa* Thunb.), a small bush cherry which grows wild on the east slope of Fuji yama.

When grown under favorable conditions Shirotae is decidedly ornamental. Trees at the Plant Introduction Garden, Chico, California, are nearly twenty-five feet high, with broad crowns, bear an abundance of flowers, and testify to the value of this variety for growing in larger estates and parks. If it is possible to have, underneath the tree plantings of the yellow *Narcissus incomparabilis*, or some of the late jonquils, the effect will be delightful.

PAUL RUSSELL.

Washington, D. C.

Nierembergia rivularis Miers. (See page 276).

In the October number for last year, Mr. Alfred Bates gave us a description of *Nierembergia frutescens*. This brought the thought to my mind that it would do no harm to give you my experience with the better known variety from the La Platte River section in South America, *N. rivularis*, which so many people have told me should be put in a class with plants that are difficult to handle. Probably this is the reason it is so rarely mentioned in books on rock gardening. For several years I had trouble in getting it established and eventually, when I did succeed in keeping one plant for more than one season, it did not bloom very



E. L. Crandall

Oriental Cherry, Shirotae

[See page 272]



Michael Carron

Nierembergia rivularis

[See page 274]

much. The essentials are very simple; soil composition does not seem to be one in spite of the usual belief.

I have had excellent results in heavy clay when the soil was not allowed to become thoroughly dried or parched

through the hot summers that we have in the vicinity of the Nation's capitol. Care should be taken not to over-water when the soil is extremely heavy. This precaution is not necessary in light sandy soils, as I have



Lilian A. Guernsey

Lycoris squamigera

[See page 278]

watered my plants every morning for weeks during dry weather and have had more abundant bloom than when I allowed them to dry out. I have had equal success in full sun and in partial shade. Personally, I like to transplant this species in late autumn or early spring, to insure good bloom the first season, but when this is impossible, I have had good results, even when moving during the blooming season when care was taken with the subsequent watering. The plants continued to bloom though the growth was retarded. When planted in the proper season, the clumps had more than doubled in size before blooming time.

The pearly-white, cup-shaped flowers are a real joy from mid-June until frost. They form sheets of bloom that literally cover the light green, heart-shaped leaves, when so few plants in the rock garden look presentable. The individual flowers have a long slender tube ending in a slightly five-lobed cup, one and one-half inches across, each appearing in the morning to last until nightfall all through the summer and early autumn when the frosts catch them and destroys both leaves and flowers and makes ready the underground stoloniferous stems for the winter.

I. N. ANDERSON.

Ballston, Va.

Lycoris squamigera Maxim. (See page 277).

A one-time residence in California has left a permanent interest in *Amaryllis belladonna*, a plant that unfortunately does not really thrive in my Eastern climate. It has lived for some six or seven years and has flowered on occasion, but only half-heartedly, in spite of the heat of a sheltering bank

and a slight cover of shrubs for its evergreen leaves. So while no plant can ever wholly take the place of any other, this lycoris is all that the amaryllis is not in the way of hardness and free-flowering. It lacks something, perhaps in the elegance of the flower, which is not quite so perfect in form and in the clarity of the coloring which is touched with a metallic blue sheen both in the bud and in the later opening.

The bulbs are of good size and should be planted deeply in rich and friable soil. They are sometimes a little slow to establish themselves, so that an immediate performance should not be expected. The leaves appear as soon as growth is possible in the spring and quickly make their full height of fifteen to eighteen inches, strap-shaped and of light blue-green color. They begin to wither in late May and by mid-June are entirely gone leaving the soil quite bare until early August when the lush flowering shoots push through the soil with astonishing rapidity. The terminal sheaths disclose from four to ten flowers of a color that is usually called rosy lilac. As a matter of fact it is a very decent rose color over which is laid a metallic blue sheen that more or less disappears as the flower matures. This combination is not so clearly defined as in *mertensia* or *forget-me-not* nor are there successive stages in coloration.

This plant is sometimes but erroneously called *Amaryllis Hallii*, after the Dr. Hall of Bristol, R. I., who introduced it into American gardens from his garden in Shanghai, China, where he grew it prior to 1860. It was largely distributed in this country by Messrs. Hovey of Boston, Mass.

Washington, D. C.

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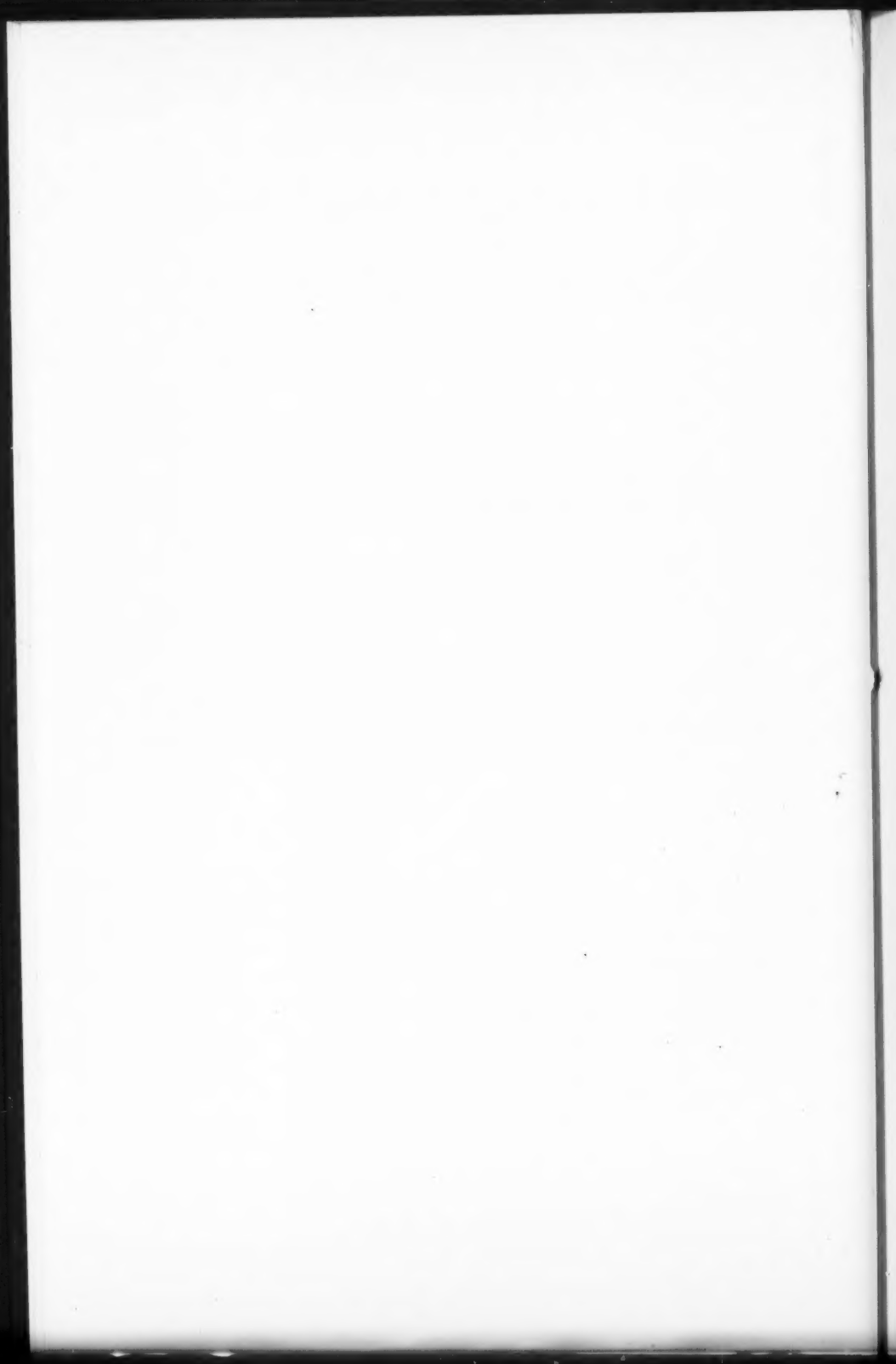
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